Synthesis of a Fluoberyllate Type (Cont.)

$2NaF \cdot KF \cdot 3BeF_2$ with $2CaO \cdot BaO \cdot 3SiO_2$ the latter was synthesized by the method described earlier by N. A. Toropov, F. Yu. Galakhov, I. A. Bondar', Izv. AN SSSR (OKhN), 1954, Nr 5, p 753. The samples were studied microscopically, by X-ray methods (CoKα radiation in a cylindrical chamber), by thermal analysis (fluoberyllate), and by specific gravity determination (with kerosene in a pycnometer at 20°). The study of the system NaF-KF-BeF_2 has established the fact that the compound $2NaF \cdot KF \cdot 3BeF_2$ occurs as a type of $2CaO \cdot BaO \cdot 3SiO_2$ in the system CaO-BaO-SiO_2. Synthetic $2NaF \cdot KF \cdot 3BeF_2$ forms elongated tabular crystals. Ng is 1.366 + (sic) 0.003; Np is 1.352 +(sic) 0.003; and Ng - Np = 0.014. The specific gravity is 2.98. For crystals of $2CaO \cdot BaO \cdot 3SiO_2$, Ng is 1.681, Np 1.668, and Ng - Np 0.013. The specific gravity is 4.69. The crystals form as small aggregates. The results of X-ray analyses for the investigated samples are given (see Table).

Synthesis of a Fluoberyllate Type (Cont.)

I/I_o	[1] N_2KB_3	[e] $N_2KB_3^*$	[d] N_2KB_3	[1] C_2BS_3	[e] $C_2BS_3^{**}$	[d] C_2BS_3	Remarks
5	20.27	17.84	2.93	17.66	17.66	2.95	Thickness of sample
1	21.78	19.17	2.72	19.16	19.16	2.73	N_2KB_3 = 0.5 mm
1	22.58	19.87	2.63	19.86	19.86	2.64	
1	23.38	20.57	2.55	20.36	20.36	2.57	$R_{eff} = \frac{65}{2}$
1	27.19	23.93	2.21	23.47	23.47	2.24	
1	27.89	24.54	2.16	24.37	24.37	2.17	
2	30.20	26.58	2.00	26.37	26.37	2.02	
1	34.21	30.10	1.78	29.58	29.58	1.80	Thickness of sample
1	36.12	31.79	1.70	31.08	31.08	1.73	C_2BS_3 = 0.3 mm

Card 3/4

Synthesis of a Fluoberyllate Type (Cont.) 15-57-7-9444

1	37.88	33.33	1.63	32.39	32.89	1.67	$R_{off} = \frac{57.20}{2}$
1	40.34	35.50	1.54	34.89	34.39	1.57	
1	43.85	38.59	1.44	37.90	37.90	1.46	
1	46.66	41.06	1.36	40.21	40.21	1.38	
1	49.87	43.89	1.29	42.51	42.51	1.32	
1	52.58	46.27	1.24	44.82	44.82	1.27	
1	--	--	--	48.93	48.93	1.19	

*N_2KB_3 = $2NaF \cdot KF \cdot 3BeF_2$

**C_2BS_3 = $2CaO \cdot BaO \cdot 3SiO_2$

Card 4/4

N. I. Kulayeva

Toropov, N.A.

137-1958-2-2291

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 11 (USSR)

AUTHOR: Toropov, N.A.

TITLE: Phase Diagrams and Their Use in Ceramics (Diagrammy sostoyaniya i primeneniye ikh v keramike)

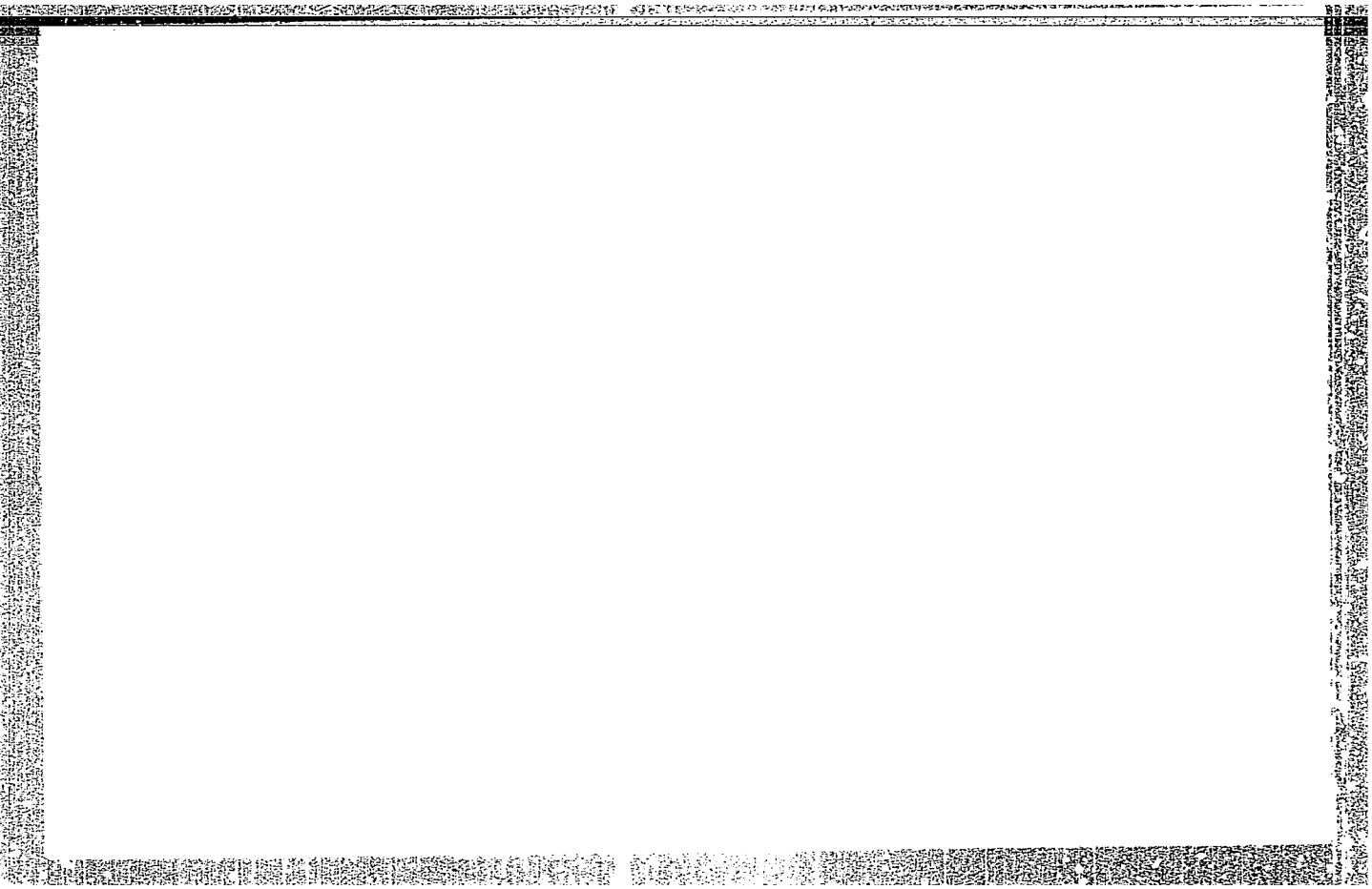
PERIODICAL: V sb.: Fiz.-khim. osnovy keramiki. Moscow, Promstroy-izdat, 1956, pp 133-138

ABSTRACT: A brief account is given of the history of the physicochemical study of silicate systems and of the development of phase diagrams of their structures. By way of example the development of the phase diagram of Al_2O_3 - SiO_2 is traced from the year 1909 (Shepherd, Rankine, Wright) to 1956 (Toropov, Galakhov). In 1951 Toropov and Galakhov established that the melting of mullite is congruent, and in 1956 they ascertained its melting temperature (1910°), also that of a eutectic between corundum and mullite (1850°). Other examples are cited of the use of phase diagrams in ceramics, and it is urged that additional diagrams be worked out, depicting such qualities as composition and properties.

S.G.

Card 1/1

1. Phase diagrams--Development 2. Ceramics--Applications



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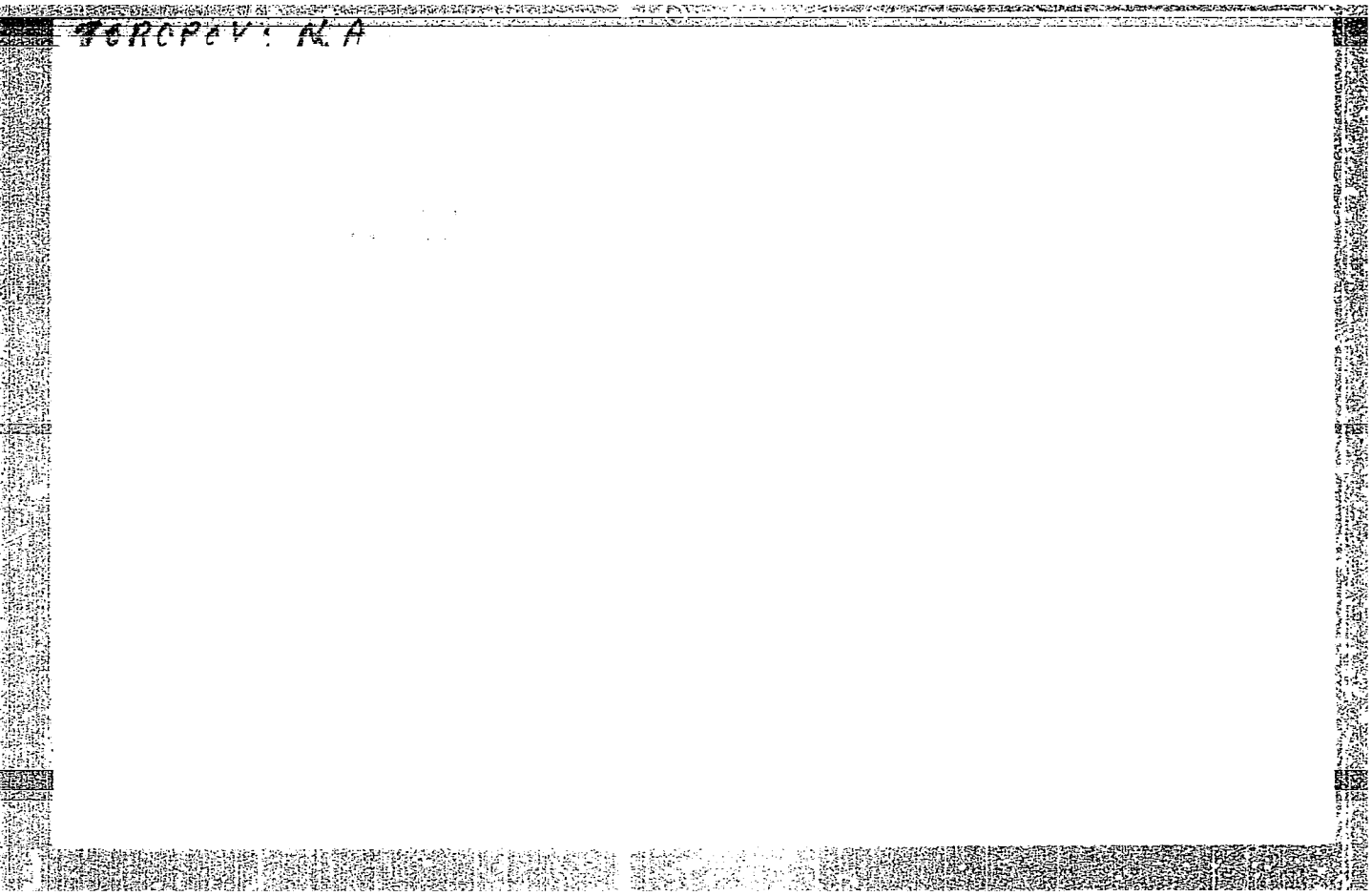

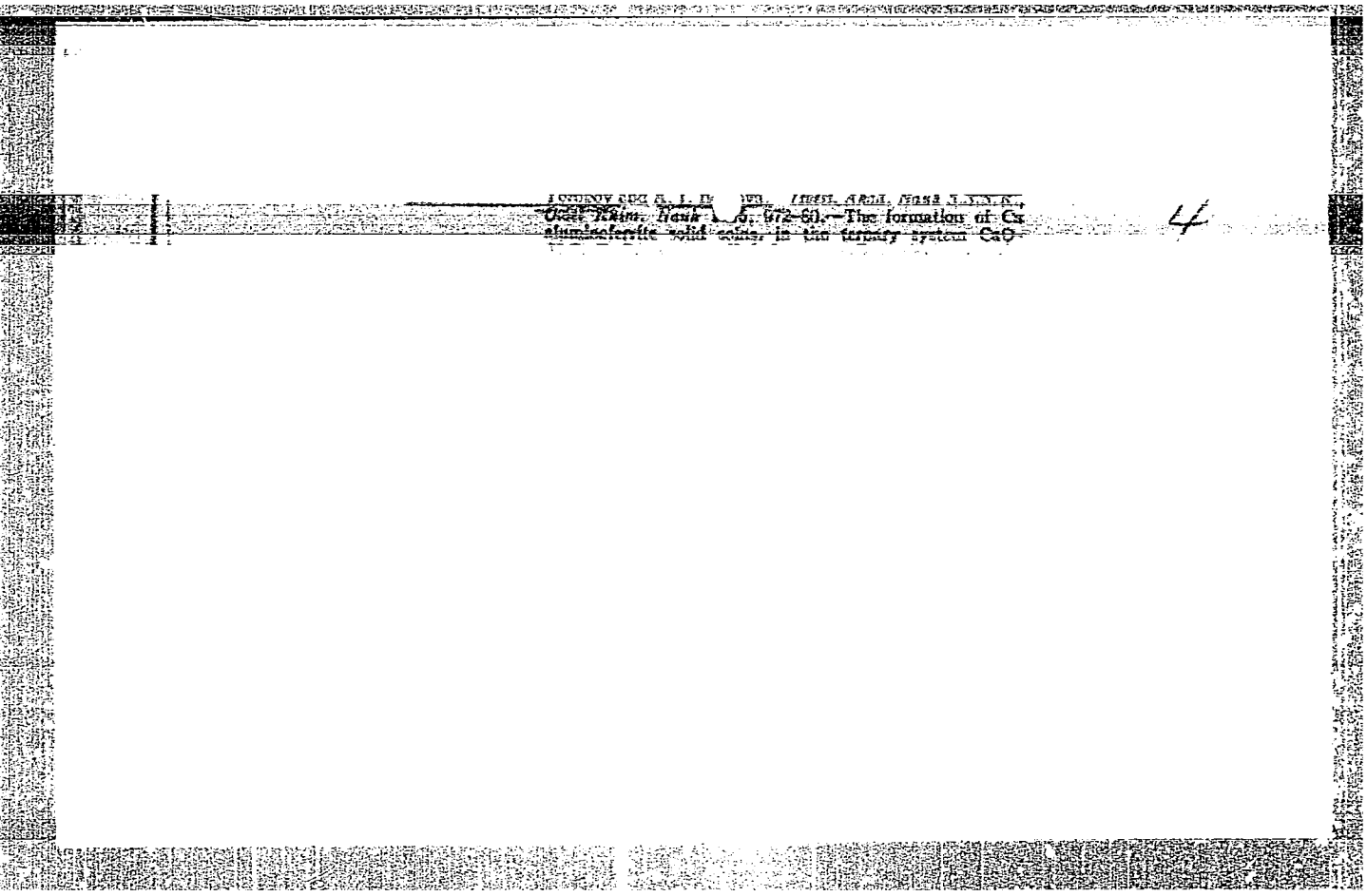

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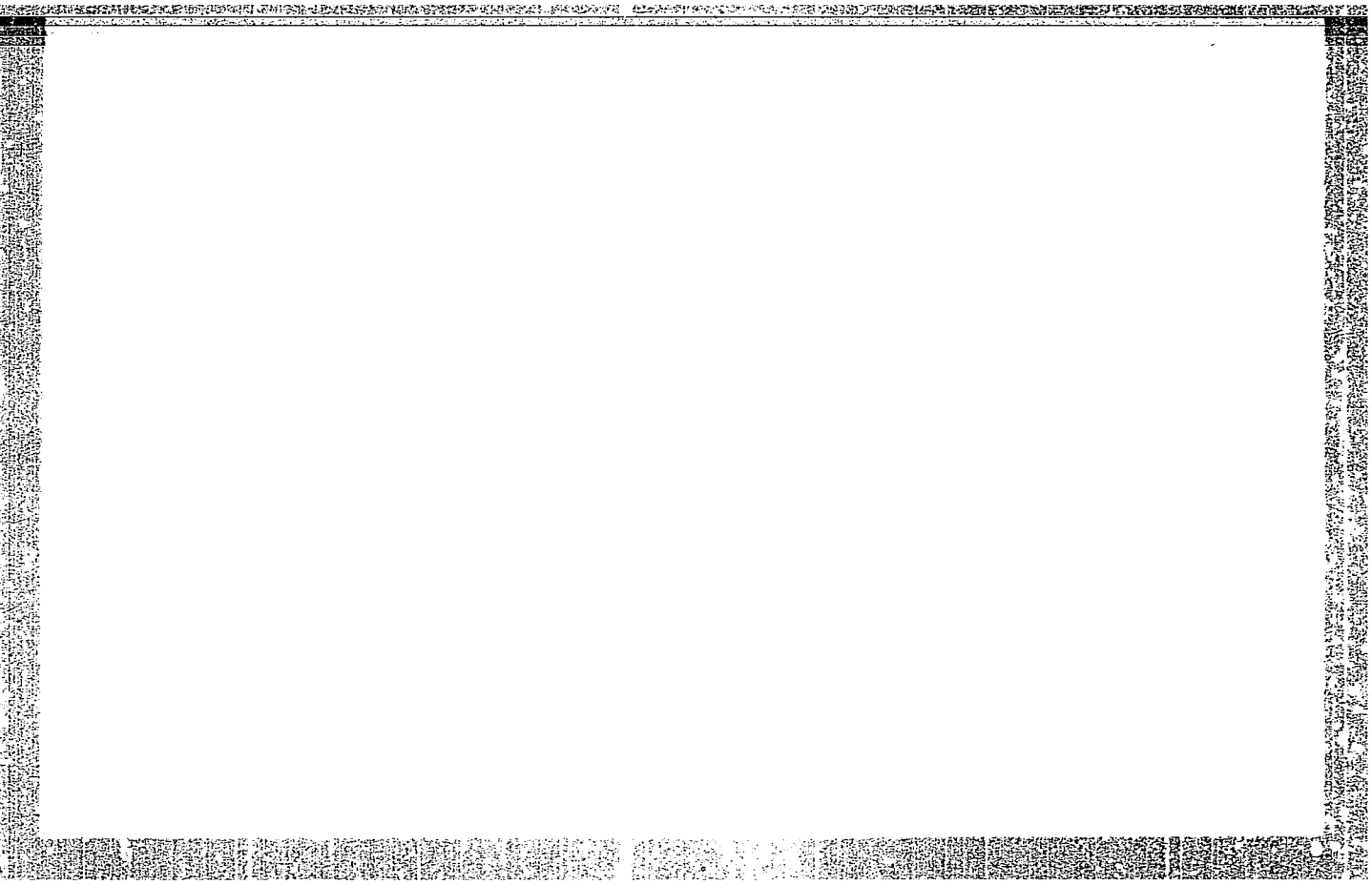

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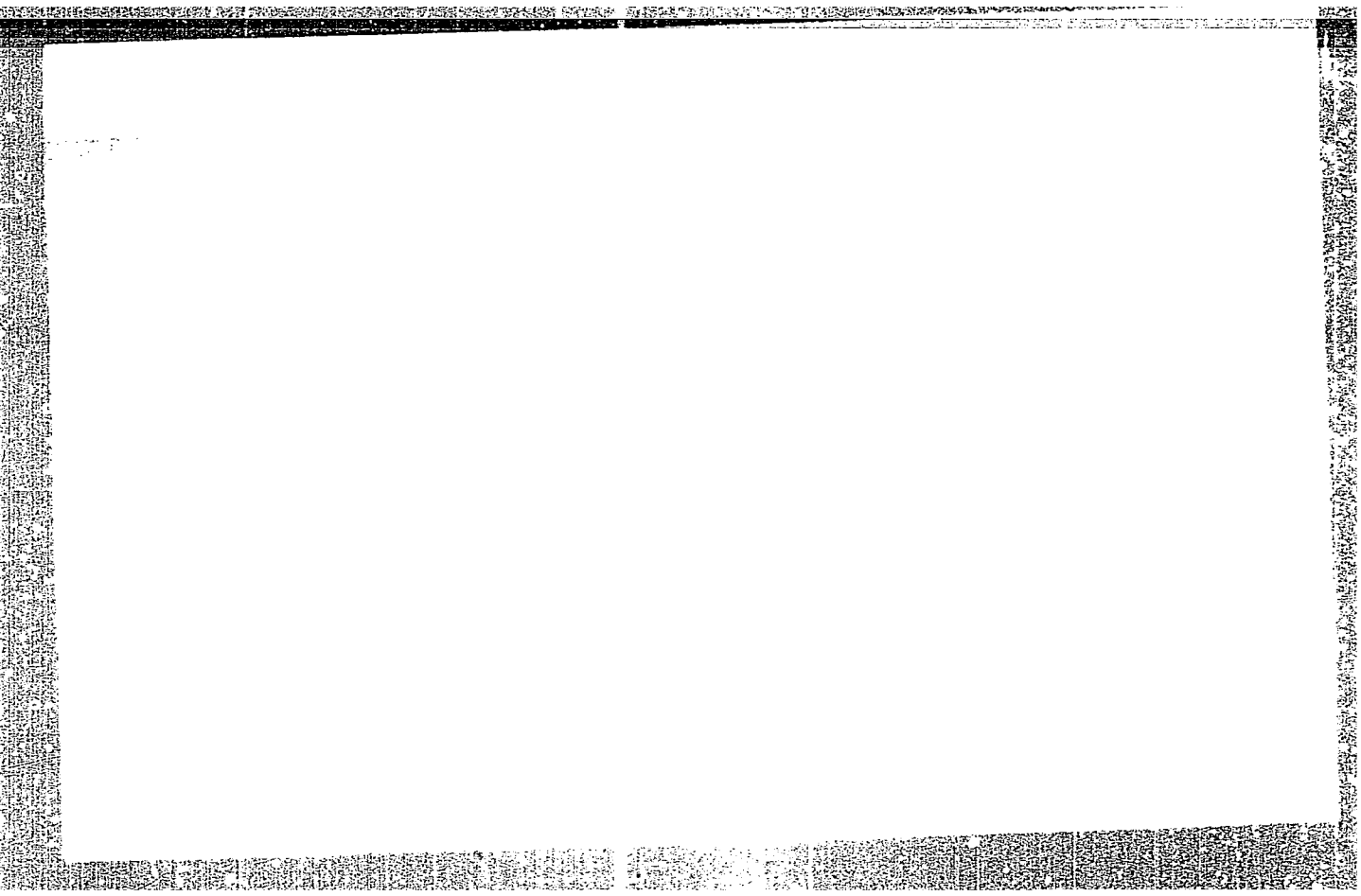


APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001756330004-2"

TOROPOV and F. Ya GALAKHOV

N.A

Liquation on the System ZrO_2 - SiO_2.

Iz. Ak. Nauk SSSR. Otdel. Khim Nauk, No 2, 1956. pp 153

Translation 564938C

Toropov N. A.

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical analysis. Phase transitions. B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29943

Author : Toropov N. A., Galakhov F. Ya., Bondar' I. A.
Inst : Academy of Sciences USSR
Title : Diagram of State of the Ternary System CaO - BaO - SiO_2.

Orig Pub: Izv. AN SSSR, Otd. khim. n., 1956, No 6, 641-648

Abstract: A study of the liquidus diagram of the system CaO (I) - BaO (II) - SiO_2 (III). Synthesis of initial specimens and the furnaces utilized have been described previously (RZhKhim, 1955, 37847). As starting materials were used 99.90% SiO_2, 98.80% $BaCO_3$, 99.88% $CaCO_3$. Phase equilibria were investigated by the methods of hardening, crystal growing, microscopically and by x-ray phase analysis. Liquidus of the system is represented by 12 fields of crystallization of different phases; composition and temperatures of invariant points are given. It was found that stratification region,

Card : 1/2

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical analysis. Phase transitions. B-8

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29943

of the I-III system, which encompasses concentrations from 72 to 99.5% III, as was shown before (Ol'shanskiy Ya. I., Dokl. AN SSSR, 1951, 76, No 1, 93), in the ternary system extends up to 11% II. Boundaries of stratification region have been determined as well as the temperatures of co-existence of crystalline phase III and two liquid layers. Coordinates of critical point of ternary system: 5% I, 11% II and 1690°.

Card : 2/2 -59-

TOROPOV, N.A., professor, doktor tekhnicheskikh nauk; BARZAKOVSKIY, V.P., doktor khimicheskikh nauk.

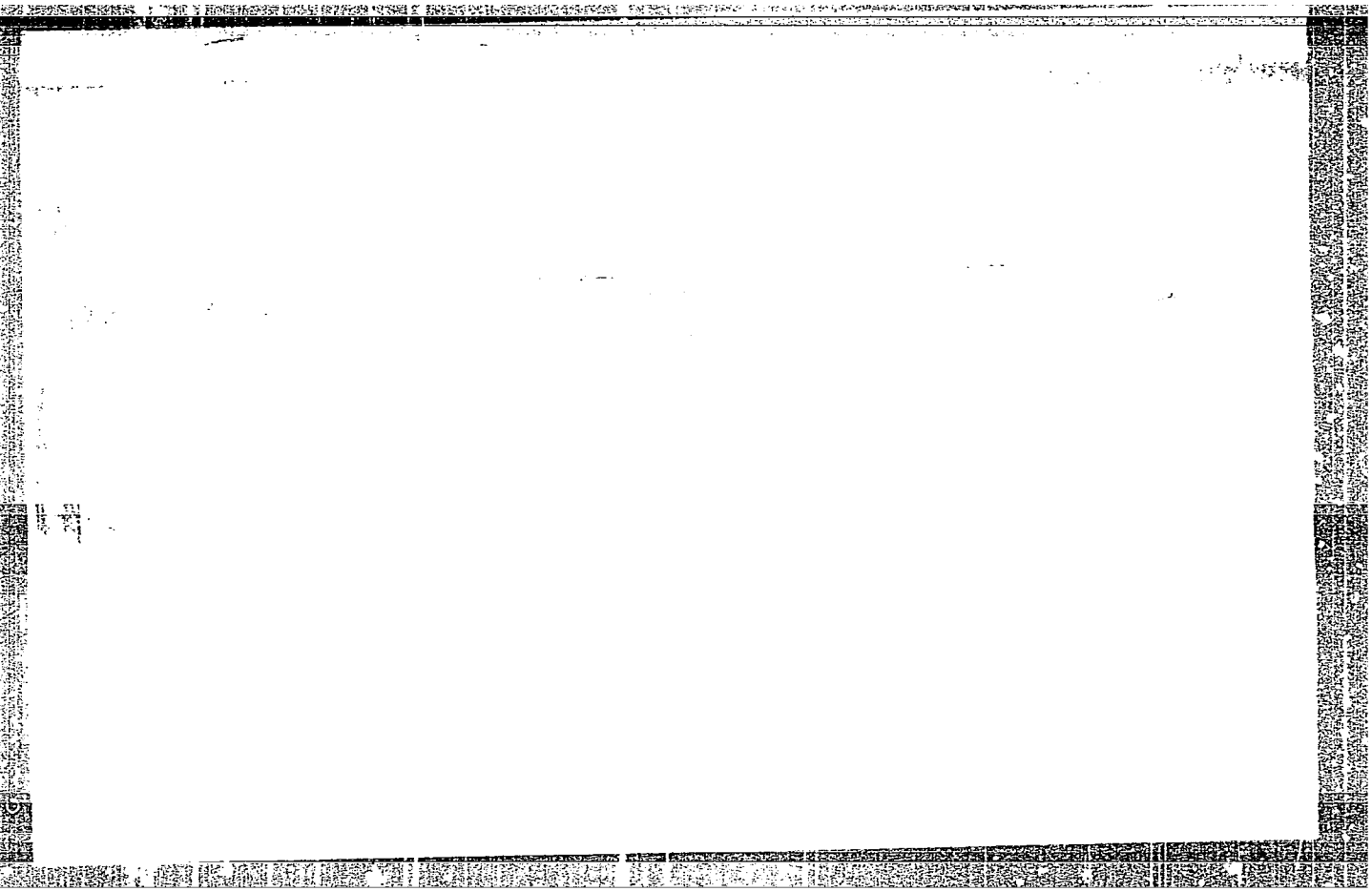
Czechoslovak scientific institutes working in the fields of chemistry and technology of silicates. Stek. i ker. 13 no.3:25-28 Mr '56. (Czechoslovakia--Silicates) (MLRA 9:6)

TOROPOV, N.A., doktor tekhnicheskikh nauk.

The Fourth International Congress on Glass. Vest.AN SSSR 26 no.12:93-94 D '56. (MLRA 10:1)
(Paris--Glass--Congresses)

TOROPOV, N.A., BONDAR, I.A.

"About Crystallisation of Dicalcium and Tricalcium Silicate in the System: $CaO-Al_2O_3-SiO_2$ in the Presence of Iron Oxides,"
lecture given at the Fourth Conference on Steelmaking, A.A. Baikov Institute of Metallurgy, Moscow, July 1-6, 1957



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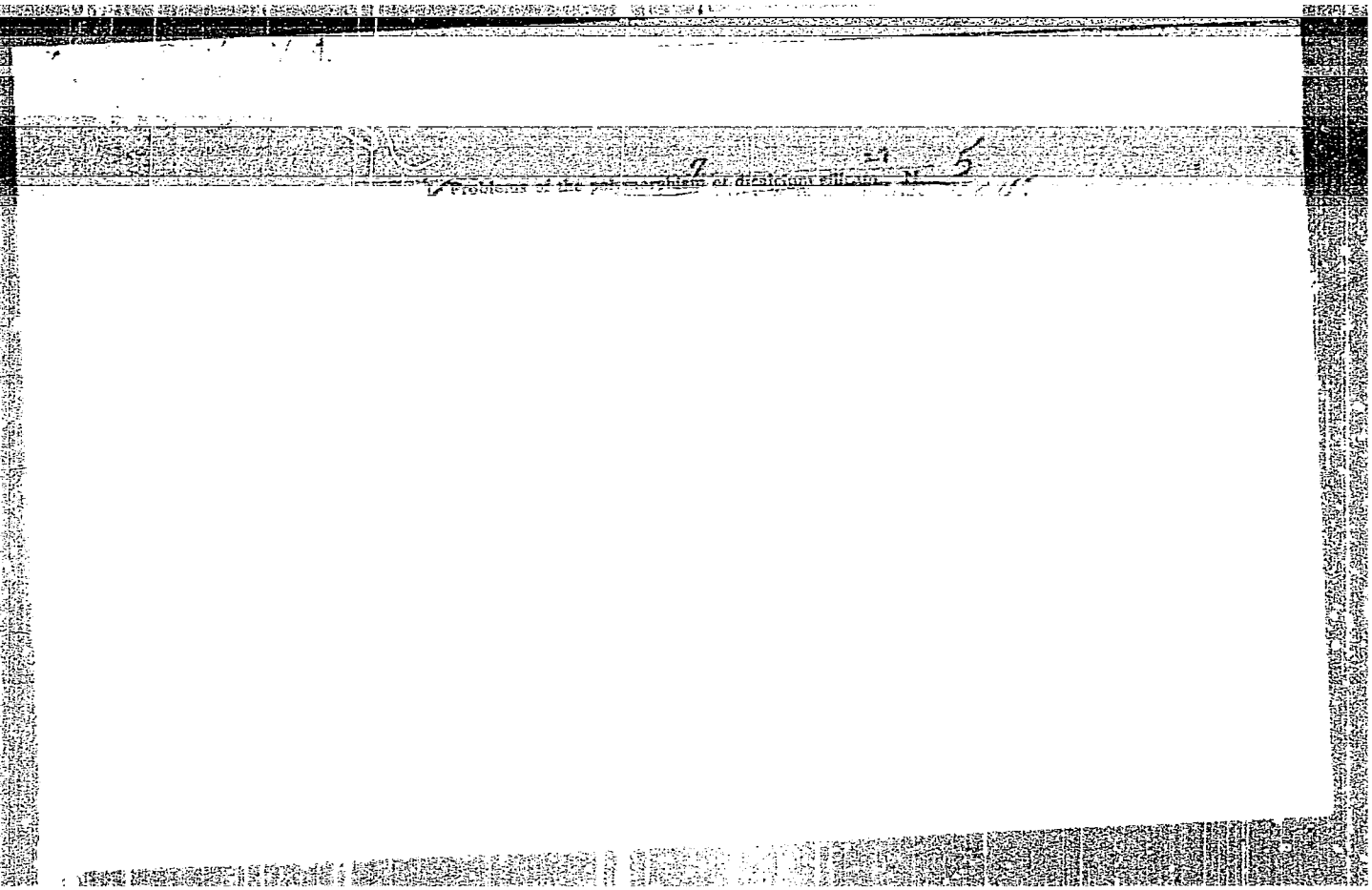
APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001756330004-2"

TOROPOV, N.A.; SHCHETNIKOVA, I.L.

Part 2: "Model" systems: Na_2BeF_4 -- Li_2BeF_4 and Ca_2SiO_4 -- Mg_2SiO_4. (MIRA 11:3)
Zhur. neorg. khim. 2 no.8:1855-1863 Ag '57.
(Systems (Chemistry))



TOROPOV, N. A., Kh. S. NIKOGOSYAN and A. I. BOYKOVA

"Synthesis and Analysis of Some Properties of Hillebrandite and Other Calcium Hydrosilicates" P. 44

[redacted]

Transactions of the Fifth Conference on Experimental and Applied Mineralogy and Petrography, Trudy ... Moscow, Izd-vo AN SSSR, 1958, 516pp.

reprints of reports presented at conf. held in Leningrad, 26-31 Mar 1956. The purpose of the conf. was to exchange information and coordinate the activities in the fields of experimental and applied mineralogy and petrography, and to stress the increasing complexity of practical problems.

TOROPOV, N. A., (Prof., Dr., Ord. Mbr. Acad. Architecture of USSR Inst. of Silicate Chemistry) and BONDAR, Y. A. (Dipl. -Ing., Leningrad).

"The Influence of Calcium Fluoride on Crystallization Characteristics in the System CaO-Al2O3-SiO2"

paper submitted at European Assn. of Ceramics, Sixth Intl. Ceramic Congress - Wiesbaden, GFR, 14-20 Sep 58.

C- 3,800,828, 25 July 1958.

TOROPOV, N. A. and F. Ya. GALAKHOV

"Solid Solutions in a Al_2O_3 - SiO_2 System" p. 505

Transactions of the Fifth Conference on Experimental and Applied Mineralogy and Petrography, Trudy ... Moscow, Izd-vo AN SSSR, 1958, 516pp.

reprints of reports presented at conf. held in Leningrad, 26-31 Mar 1956. The purpose of the conf. was to exchange information and coordinate the activities in the fields of experimental and applied mineralogy and petrography, and to stress the increasing complexity of practical problems.

KONOVALOV, P.F.; YEFREMOV, A.I.; VOLKONSKIY, B.V.; TOROPOV, N.A., prof., doktor tekhn.nauk, red.; SAIKOV, V.I., red.

[X-ray analysis ionization chamber for investigating crystalline materials at various temperatures] Ionizatsionnaia rentgeno-strukturnaia ustanovka dlia issledovaniia kristallicheskikh veshchestv pri razlichnykh temperaturakh. Pod red. N.A.Toropova. Leningrad, Nauchno-tekhn.ob-vo promyshl.stroit.materialov, Leningr. obl.prav., 1958. 133 p. (MIRA 12:3)

1. Deystvitel'nyy chlen Akademii stroitel'stva i arkhitektury SSSR (for Toropov).
(X-ray crystallography--Equipment and supplies)

62-1-2/29

AUTHORS: Toropov, N. A., and Galakhov, F. Ya.

TITLE: The Solid Solutions in the System Al_2O_3 - SiO_2 (Tverdyye rastvory v sisteme Al_2O_3 - SiO_2)

PERIODICAL: Izvestiya AN SSSR Otdeleniya Khimicheskikh Nauk, 1958, Nr 1, pp 8-11 (USSR)

ABSTRACT: The variety of the structure of the crystals of synthetic sillimanite noticed by Rayt (reference 1) was the reason of the new research works of Bowen and Greig (reference 2). The chemical compound (formed by the components of the system) has the new formula 3 Al_2O_3 . 2 SiO_2. In 1951 the authors during the investigation of the socalled three component system detected for the first time BaO-Al_2O_3-SiO_2 the crystallization of the mullite which, however, did not correspond to the diagram of the system Al_2O_3 - SiO_2 (according to Bowen and Greig). In the new variant of the diagram a maximum was established which corresponded to the melting temperature of mullite. Later research works (Budnikov etal. reference 4) confirmed the congruent character of the mullite melt. Later it was found by Posnjak, Greig (reference 6), Rooksby, Partridge (reference 7) by means of the radiographic method that mullite can form solid solutions in alumina. Sheers and

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62-1-2/29

The Solid Solutions in the System Al_2O_3 - SiO_2

Archibald (reference 8) made a correction of the diagram of the system (according to Bowen and Greig, reference 2). (See figures 1 and 2). The given variant, however, gives rise to serious doubts in the correctness of the diagram. It is contradicting to the fact found by the authors that mullite melts without decomposition. Furthermore the above mentioned variant has not yet been checked experimentally (investigation of the crystallization of the corresponding mixtures). In the present paper the authors describe the investigation carried out by them according to the hardening method of part of the system Al_2O_3 - SiO_2 with a high content of alumina (figure 3). According to the obtained results a new diagram was made (see figure 2). Here again the congruent character of the melting of mullite was confirmed. There are 3 figures, 1 table, and 9 references, 4 of which are Slavic.

ASSOCIATION: Institute of Silicate Chemistry, AS USSR (Institut Khimii silikatov Akademii nauk SSSR)

SUBMITTED: January 8, 1957
AVAILABLE: Library of Congress

Card 2/2

1. Synthetic sillimanite crystals-Structural analysis
2. Synthetic sillimanite-Chemical analysis

SOV/136-58-9-10/21

AUTHORS: Toropov, N.A. and Arakelyan, O.I.

TITLE: Investigation of Ferrite Phases in the Systems $Na_2O.Fe_2O_3$ - $2CaO.Fe_2O_3$, ($CaO.Fe_2O_3$, $CaO.2Fe_2O_3$) and $Na_2O.Al_2O_3$ - $2CaO.Fe_2O_3$. (Issledovaniye ferritnykh faz v sistemakh $Na_2O_3.Fe_2O_3$ etc)

PERIODICAL: Tsvetnyye Metally, 1958, Nr 9, pp 48-52 (USSR)

ABSTRACT: The phases found in two systems of interest in the treatment of bauxites were studied by microscopy in polarized and reflected light and by X-ray analysis. For this a series of synthetic specimens with compositions changing by ∓ 10% between each, prepared by sintering the corresponding mixtures at, and re-sintering the first product at 1150-1275°C. Experiments on the leaching of the products (Table 2) were carried out by A.S. German-Galkina. It was found that for the system $Na_2O.Fe_2O_3$ - $2CaO.Fe_2O_3$ ($CaO.Fe_2O_3$, $CaO.2Fe_2O_3$) there was a eutectic ratio of components in the specimens, in the system $Na_2O.Fe_2O_3$ - $2CaO.Fe_2O_3$ the eutectic has a melting point of 1185 ∓ 10° and contains 53% of $Na_2O.Fe_2O_3$ and 47% 2CaO.

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SOV/136-58-9-10/21

Investigation of Ferrite Phases in the Systems $Na_2O.Fe_2O_3$ - $2CaO.Fe_2O_3$, ($CaO.Fe_2O_3$, $CaO.2Fe_2O_3$) and $Na_2O.Al_2O_3$ - $2CaO.Fe_2O_3$

Fe_2O_3. The calcium ferrites formed in an alkaline medium form optically opaque crystals with a weak dark brown pleochroism. In the system $Na_2O.Al_2O_3$ - $2CaO.Fe_2O_3$ the components react to form solid solutions of sodium aluminate and ferrite and calcium aluminoferrites; the formation of the last leads to a decrease in the recovery of alumina when leaching the cake with aqueous alkali and therefore it is not advisable when choosing a new type of charge, to replace $Na_2O.Fe_2O_3$ completely by calcium ferrite.

There are 2 figures, 3 tables and 10 references (4 Soviet, 3 English, 2 Italian and 1 German)

Card 2/2 1. Bauxites -Processing 2. Metal Oxides--Phase studies 3. Metal oxides--Test methods 4. Metal oxides--Chemical reactions

TOROPOV, N.A.; BONDAR', I.A.

Crystallization of dicalcium and tricalcium silicates in cements having a high content of iron oxide. TSement 24 no.1:18-22 Ja-Fe '58. (MIRA 11:4)

(Portland cement)
(Calcium silicates)

5(4)

AUTHORS: Toropov, N. A., Bondar', I. A. SOV/62-59-3-30/37

TITLE: Lanthanum Silicate $2La_2O_3 \cdot 3SiO_2$ (Silikat lantana $2La_2O_3 \cdot 3SiO_2$)

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1959, Nr 3, pp 554-555 (USSR)

ABSTRACT: This is a brief communication on the synthesis of lanthanum silicate $2La_2O_3 \cdot 3SiO_2$ ($La_4Si_3O_{12}$) which was carried out in the investigation of the system La_2O_3 - SiO_2. The synthesized silicate melts at 2,020° without decomposition. Microscope and X-ray structural analyses have shown that it is characterized by hexagonal syngony (Figs 1,2). The compound $La_4Si_3O_{12}$ is separated in form of hexagonal lamellae with white and orange interference coloration in polarized light. The mean value of the refraction index of the crystals, which was determined in the section by means of the modernized microscope MIS-11, was 1.90. The pycnometric density of lanthanum silicate corresponds to 5.31 g/cm^3. As was shown by computations two $2La_2O_3 \cdot 3SiO_2$ molecules are contained in the elementary cell. The density

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which was determined on the basis of X-ray data is 5.303 g/cm^3. Apparently $La_4Si_3O_{12}$ belongs, according to its structure to the olivine group with separated tetrahedal anions $\left[SiO_4\right]^{4-}$ and is the lanthanum orthosilicate $La_4(SiO_4)_3$. In this case a replacement of the six atoms of the bivalent element by four atoms of trivalent lanthanum ($6Me^{2+} \rightleftharpoons 4La^{3+}$) is possible. There are 3 figures, 1 table, and 2 references, 1 of which is Soviet.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences, USSR)

SUBMITTED: July 19, 1958

5(4), 15(2) SOV/78-4-5-35/46

AUTHORS: Toropov, N. A., Nikogosyan, Kh. S., Boykova, A. I.

TITLE: On the Dehydration of Calcium Hydrosilicate $2CaO.SiO_2.H_2O$ - Hillebrandite (O degidratatsii gidrosilikata kal'tsiya $2CaO.SiO_2.H_2O$ - gillebrandita)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 5, pp 1159-1164 (USSR)

ABSTRACT: The dehydration products of natural and synthetic hillebrandite were investigated by means of X-ray analyses, crystallo-optic, and thermal analyses. Natural hillebrandite shows weak double refraction with the refraction indices N_g=1.612 and N_p=1.606 as well as impurities of calcite. Synthetic hillebrandite was produced from a mixture of SiO_2 and $Ca(OH)_2$ with a surplus of water in the autoclave at 250° in the course of 10 days. The preparation has refraction indices of from 1.601 to 1.608. The radiographical investigations carried out with the two preparations are shown by table 1.

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On the Dehydration of Calcium Hydrosilicate $2CaO.SiO_2.H_2O$ - Hillebrandite

SOV/78-4-5-35/46

The radiograms of natural and synthetic hillebrandite differ very little from each other. The differential heating curves of natural and synthetic hillebrandite were plotted and are shown in figure 1. By the crystallo-optic, thermal, and X-ray phase analyses it was found that synthetic and natural hillebrandite are identical. The dehydration of hillebrandite was carried out within the temperature interval of between 300 and 1200° and within the time of from 1 to 150 hours. During the process amorphous products are formed both in synthetic and natural hillebrandite. For forming an amorphous product the temperature of natural hillebrandite is somewhat higher than that of the synthetic product (535 and 540°). This shows that the crystals of natural hillebrandite are more developed than those of the synthetic product and are therefore not so easily destroyed. The refraction indices of the dehydration products of natural and synthetic hillebrandite are greater than in the initial products. The variation of the refraction index during the process of heating is shown by figure 4. There

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On the Dehydration of Calcium Hydrosilicate $2CaO.SiO_2.H_2O$ - Hillebrandite

SOV/78-4-5-35/46

are 4 figures, 1 table, and 14 references, 2 of which are Soviet.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute for the Chemistry of Silicates of the Academy of Sciences, USSR)

SUBMITTED: February 20, 1958

Card 3/3

SOV/72-59-5-21/23

15(2)
AUTHOR: Toropov, N. A.

TITLE: The VI International Congress on Ceramics (VI Mezhdunarodnyy keramicheskiy kongress)

PERIODICAL: Steklo i keramika, 1959, Nr 5, p 43 (USSR)

ABSTRACT: This congress took place at Wiesbaden (German Federal Republic) in September 1958 and had been convened by the European Association of Ceramists. The national ceramic societies of the following countries are members of the Association: Belgium, Denmark, Germany, France, Great Britain, Italy, Holland, Norway, Austria, Sweden. Silicate experts of the Soviet Union and of the People's Democracies of Czechoslovakia, Poland, and Hungary attended the Congress for the first time. Scientists of the following countries were present: the United Arab Republic, Portugal, USA, Israel, Japan, India, Mexico, Luxembourg, and Greece. In the Section of Scientific Research Toropov and Bondar' (USSR) held a lecture on the effect of calcium additions containing fluorine on the crystallization conditions in the system $CaO-Al_2O_3-SiO_2$. The problems of the technology and utilization

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of ceramics, of the investigation of their structure and mechanical properties were discussed in other Sections of the Congress. Excursions were made to scientific research institutes and industrial enterprises. The author of this article especially mentions the new devices and apparatus for scientific research. The next International Congress on Ceramics is supposed to take place in Scandinavia.

SOV/62-59-9-2/40

5(2)
AUTHORS: Toropov, N. A., Bondar', I. A.

TITLE: Investigation of the Crystallization Processes in the $CaO-Al_2O_3-SiO_2$-system After the Addition of 10% of CaF_2

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1959, Nr 9, pp 1520-1525 (USSR)

ABSTRACT: The present investigation was carried out in cooperation with the Institute of Metallurgy and Ceramics of the Academy of Sciences of the Chinese People's Republic (Doctor Yang Tun-sung) to study the corroding effect of fluorine containing blast-furnace slag on refractories. The following authors who studied this problem are listed: Karandeyev (Ref 3), Ol'shanskiy (Ref 6), Yershova (Ref 7), Lapin (Ref 8). The synthesis of the samples was carried out in a vacuum furnace in an argon flow at high temperatures. The samples were subsequently thermally treated at various temperatures. They were investigated with polarization- and electron-microscopes. The fluorine loss suffered in preparation and thermal treatment was only 0.09 - 0.05%. The primary crystallization range and the melting range were determined by the diagram. An addition of 10% CaF_2 to the ternary system

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Investigation of the Crystallization Processes in the $CaO-Al_2O_3-SiO_2$-system After the Addition of 10% of CaF_2

proved to extend the melting range considerably (lowering of the liquefaction temperature) (Fig 1). The congruent character of the mullite melts was also confirmed. Separated drops of a basic glass were observed in the silica glass by means of the polarization microscope. The radii of the forming nuclei of the new glass were calculated according to the formula set up by Frenkel' which is discussed in Umanskiy's book (Ref 11). The dependence of the length of the radius on the temperature can be determined with this formula (Fig 4). The radii increase continuously with the rising hardening temperature up to a maximum when the new formation of nuclei prevents further increase. The addition of CaF_2 does not change the boundary of the phases, but lowers liquefaction temperature and changes the arrangement of the field boundaries of several phases. These phases are determined. There are 7 figures and 11 references, 7 of which are Soviet.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences, USSR)

24 (4), 15 (2) SOV/32-25-6-22/53

AUTHORS: Toropov, N. A., Alekseyeva, A. N.

TITLE: Method of Investigating the Structure of Porcelain Under the Microscope (Metod issledovaniya struktury farfora pod mikroskopom)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 707-710 (USSR)

ABSTRACT: Microscopic investigations were carried out on porcelain samples by applying simultaneously the penetrating and the reflected light ray. Thin and transparent ground sections with polished surface were prepared for the purpose. Some of the samples were additionally investigated radiographically. (Ref 8). The conditions under which the porcelain sections were prepared are described (Table 1); pickling took 2-3 minutes in a 10 % hydrofluoric acid. The phase composition of an insulation porcelain (Fig 1) obtained by the method described, consisted chiefly of a mixture of fine-disperse mullite and glass, containing scattered quartz grains and vitrified feldspar grains with smaller and brighter mullite particles. The size of the quartz grains varied form 0.008 to 0.064 mm (mostly 0.02-0.03 mm), whereas the vitrified feldspar was predominantly coarse-grained

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(0.05-0.09 mm). The fact that the mullite could not be observed in the principal mass of the porcelain is explained by its overall fine dispersion. Also a quantitative phase determination on the polished ground section was carried out (Table 2). The method described made it possible to state that mullite crystallizes only in vitrified feldspar and is visible in the form of needles under microscopic investigation with penetrating light. There are 2 figures, 2 tables, and 8 references, 7 of which are Soviet.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute for the Chemistry of Silicates of the Academy of Sciences, USSR)

TOROPOV, N.A., kand.tekhn.nauk

Sixth International Ceramics Congress. Vest. AN SSSR 29 no.3:108 Mr '59. (MIRA 12:4)
(Wiesbaden—Ceramics—Congresses)

5(4) SOV/20-126-3-44/69

AUTHORS: Stavitskaya, G. P., Smolin, Yu. I., Toropov, N. A., Poray-Koshits, Ye. A.

TITLE: On Problems in the Crystallization of Hillebrandite at Hydrothermal Conditions (K voprosu o kristallizatsii gillebrandita v gidrotermal'nykh usloviyakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 3, pp 616-618 (USSR)

ABSTRACT: In the introduction to this paper it is pointed out that the phenomenon of the recrystallization of hillebrandite by the solution, as discovered at the laboratory of Academician P. A. Rebinder in the solidification of gypsum, is to be investigated. The samples, which were obtained from a stoichiometric mixture of an amorphous silicic acid and finely dipersed calcium oxide, were investigated by means of an electronic microscope, and the crystals were identified by means of an X-ray phase analysis. In eight pictures made with the electron microscope (Fig 1) the initial mixtures and the products of hydrothermal synthesis within a period of up to thirteen days, and in a diagram the corresponding ionization curves (Fig 2) are shown. The results obtained by the investigations show a crystallization developing in three stages: 1) Rapid precipitation of needle-shaped hillebrandite crystals

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On Problems in the Crystallization of Hillebrandite at Hydrothermal Conditions SOV/20-126-3-44/69

from the oversaturated solution. 2) A solution of thermodynamically fluctuating hillebrandite crystals with distorted structure. 3) Increase of hillebrandite crystals with regular lattice, i.e. recrystallization of hillebrandite by the solution. There are 3 figures and 2 references, 1 of which is Soviet.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of the Chemistry of Silicates of the Academy of Sciences, USSR)

PRESENTED: October 16, 1958 by P. A. Rebinder, Academician

SUBMITTED: August 21, 1958

Card 2/2

BARZAKOVSKIY, Valentin Pavlovich; DOBROTIN, Roman Borisovich; TOROPOV, N.A., prof., otv.red.; KAPLAN, M.Ya., red.izd-va; AROMS, R.A., tekhn.red.

[D.I.Mendeleev's works in the field of the chemistry of silicates and glass research] Trudy D.I.Mendeleeva v oblasti khimii silikatov i stekloobraznogo sostoianiia. Moskva, Izd-vo Akad.nauk SSSR, 1960. (MIRA 13:8)

1. Deystvitel'nyy chlen Akademii stroitel'stva i arkhitektury SSSR (for Toropov).
(Glass research) (Silicates)
(Mendeleev, Dmitrii Ivanovich, 1834-1907)

PORAY-KOSHITS, Ye.A., doktor fiz.-matem.nauk, red.; AVGUSTINIK, A.I., red.; BARZAKOVSKIY, V.P., red.; BEZBORODOV, M.A., red.; BOTVINKIN, O.K., red.; VARGIN, V.V., red.; VLASOV, A.G., red.; YEVSTROP'YEV, K.S., red.; LEBEDEV, A.A., akademik, red.; MATVEYEV, M.A., red.; MOLCHANOV, V.S., red.; MYULLER, R.L., doktor tekhn.nauk, red.; TOROPOV, N.A., red.; FLORINSKAYA, V.A., red.; YAKHKIND, A.K., red.; SUVOROV, I.V., red.izd-va; BOCHEVER, V.T., tekhn.red.

[Vitreous state; transactions of the Third All Union Conference on the vitreous state] Stekloobraznoe sostoianie; trudy Vsesoiuznogo soveshchaniia po stekloobraznomu sostoianiiu. Moskva, Izd-vo Akad. nauk SSSR, 1960. 534 p. (MIRA 13:10)

1. Vsesoyuznoye soveshchaniye po stekloobraznomu sostoyaniyu. 3d, Leningrad, 1959.

(Glass--Congresses)

Toropov, N. A.

82038

S/062/60/000/02/01/012
B003/B066

15.2210

AUTHORS: Toropov, N. A., Bondar', I. A.

TITLE: Silicates of Rare Earths. 1st Report. Phase Diagram of the System La_2O_3-SiO_2

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1960, No. 2, pp. 153 - 156

TEXT: The present paper deals with the binary system La_2O_3-SiO_2. 99.90% of SiO_2 powder and 99.3% of La_2O_3 were used as initial substances for preparing the various mixtures. The individual samples were studied by means of a microscope and X-ray structural analysis. The refractive indices of highly refractive substances were determined by means of an improved МИС-11 (MIS-11) microscope. A change of the valence of lanthanum by heating La_2O_3 in an argon atmosphere was found to be negligible on the basis of changes in weight and volumetric determinations of the LaO content, respectively (LaO content at 1800°C - 0.15 per cent by weight.

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B003/B066

Silicates of Rare Earths. 1st Report. Phase Diagram of the System La_2O_3-SiO_2

at 2100°C - 0.65 per cent by weight). Results: Fig. 1 shows the phase diagram of the binary system investigated (the system contains the compound $2La_2O_3 \cdot 3SiO_2$ and two eutectics consisting of the afore-mentioned compound and La_2O_3, or of $2La_2O_3 \cdot 3SiO_2$ and cristobalite). The compound $2La_2O_3 \cdot 3SiO_2$ existing in the system was identified as the orthosilicate of lanthanum $La_4(SiO_4)_3$ which is characterized by hexagonal syngony (Figs. 2a and b). (The microhardness of the crystals (655 kg/mm^2) was determined on a ПМТ-3 (PMT-3) device). The data of the X-ray analysis of the compound may be seen from a table. At a content of 50 - 90 wt% of SiO_2, two immiscible vitreous liquids (Figs. 4 and 5) are in monotectic equilibrium with cristobalite at 1650°C. There are 5 figures, 1 table, and 6 references: 3 Soviet, 1 British, and 2 American.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR)

SUBMITTED: December 26, 1958

Card 2/2

TOROPOV, N.A.

Physicochemical analysis of silicate systems (Kurnakov lecture of December 8, 1959). Zhur. neorg. khim. 5 no.4:763-771 Ap '60.
(Silicates)
(Systems (Chemistry))

S/078/60/005/011/010/025
B015/B060

AUTHORS: Toropov, N. A., Lin' Tszu-Syan

TITLE: Study of the Ga_2O_3 - SiO_2 Binary System

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 11, pp. 2462-2465

TEXT: The authors studied the constitution diagram of the Ga_2O_3 - SiO_2 binary system to discover whether there exists the compound $3Ga_2O_3 \cdot 2SiO_2$ in analogy to compound $3Al_2O_3 \cdot 2SiO_2$. The investigation was conducted by the static method of glowing and hardening, the rod-like specimens being subjected to heat treatment in a microfurnace devised by F. Ya. Galakhov (Ref. 2) (1800°C, time 1 minute). The specimens were submitted to chemical analysis (Table 1, composition). Microscopic and X-ray examinations were made after the prior heat treatment. Eight compositions were investigated, and the results of hardening and refractive indices of the glasses are given in Table 2, the constitution diagram being shown in Fig. 1. It is a

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simple diagram with the eutectic point corresponding to 87% SiO_2 by weight and equal to 1565±10°C. A comparison with the respective data for the system Al_2O_3 - SiO_2 shows that both systems resemble as to the phase conditions in the SiO_2-rich region. The difference between the two systems, on the other hand, consists in that at Ga_2O_3 - SiO_2 there is no mullite-like compound and the S-shaped liquidus of this system points to a tendency to separate into layers, as in the BaO - SiO_2 system, this tendency being stronger in the Ga_2O_3 - SiO_2 system. The refractive indices of glasses in the system Ga_2O_3 - SiO_2 rises rapidly with an increase of the Ga_2O_3 content. Tests made on specimens prepared under hydrothermal conditions likewise showed (Table 3) that no compounds are formed between Ga_2O_3 and SiO_2. There are 4 figures, 3 tables, and 5 references: 1 Soviet, 1 German, and 3 US.

Card 2/3

Study of the Ga_2O_3 - SiO_2 Binary System

S/078/60/005/011/010/025
B015/B060

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR Fiziko-khimicheskaya laboratoriya (Institute of the Chemistry of Silicates of the Academy of Sciences USSR, Physicochemical Laboratory)

SUBMITTED: July 1, 1959

Card 3/3

87333

S/078/60/005/011/020/025/XX
B004/B060

15.2100 1142, 1273, 1145

AUTHORS: Toropov, N. A., Lin Tsu-hsiang

TITLE: Study of the $Ca_2Al[AlSiO_7]$ - $Ca_2Ga[GaSiO_7]$ System

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 11, pp. 2466 - 2470

TEXT: The authors dealt with the problem of substituting gallium for aluminum. For this purpose, they synthesized the crystallochemical analog of galena: $Ca_2Ga_2SiO_7$. X-ray analysis of this compound confirmed the similarity of its crystal structure with that of galena. The present article deals with the problem as to whether solid solutions exist in the $Ca_2Al[AlSiO_7]$ - $Ca_2Ga[GaSiO_7]$ system. The initial substances were: rock crystal, Ga_2O_3 (obtained from 99.9% gallium), pure Al_2O_3, and $CaCO_3$. Mixtures from powders of these substances were molded to rodlets by means of dextrin, annealed at 1100°C and melted in the oxyhydrogen blowpipe. The glass specimens obtained were annealed in a furnace for one hour at different temperatures. Tests included specimens with the compositions

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B004/B060

Study of the $Ca_2Al[AlSiO_7]$ - $Ca_2Ga[GaSiO_7]$ System

$Ca_2Al_{1.6}Ga_{0.4}SiO_7$, $Ca_2AlGaSiO_7$, and $Ca_2Al_{0.4}Ga_{1.6}SiO_7$. All of the three specimens crystallized in homogeneous phases, thus confirming the existence of solid solutions in this system. Since liquidus and solidus curve were near each other, it was not possible to set up a constitution diagram. Table 1 gives the refractive indices of crystals and glasses, as well as the melting temperatures:

Composition of specimen	Refractive index crystals N_g	N_p	glass	Melting temperature °C
$Ca_2Al_2SiO_7$	1.669	1.658	1.635	1590
$Ca_2Al_{1.6}Ga_{0.4}SiO_7$	1.678	1.667	1.651	1565
$Ca_2AlGaSiO_7$	1.694	1.686	1.674	1535
$Ca_2Al_{0.4}Ga_{1.6}SiO_7$	1.714	1.702	1.698	1490
$Ca_2Ga_2SiO_7$	1.723	1.713	1.712	1465

Table 3 gives the lattice constants and the volumes of the unit cells:

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Study of the $Ca_2Al[AlSiO_7]$ - $Ca_2Ga[GaSiO_7]$ System

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S/078/60/005/011/020/025/XX
B004/B060

Composition of specimen	Lattice constants a_o,A	c_o,A	c_o/a_o,A	Volume of unit cell, A^3
$Ca_2Al_2SiO_7$	7.69	5.07	0.659	299.84
$Ca_2Al_{1.6}Ga_{0.4}SiO_7$	7.71	5.08	0.659	301.96
$Ca_2AlGaSiO_7$	7.74	5.10	0.659	305.54
$Ca_2Al_{0.4}Ga_{1.6}SiO_7$	7.77	5.12	0.659	309.09
$Ca_2Ga_2SiO_7$	7.79	5.13	0.659	311.29

It was thus found that with increased substitution of gallium for aluminum the refractive index of glasses and crystals and the volume of the unit cell rise, while the melting temperature drops. There are 6 figures, 3 tables, and 2 non-Soviet references.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry, Academy of Sciences USSR)

SUBMITTED: July 4, 1959

Card 3/3

S/078/60/005/012/008/016
B017/B064

AUTHORS: Ryskin, Ya. I., Stavitskaya, G. P., Toropov, N. A.

TITLE: Infrared Absorption Spectra of Hydrated Silicates

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 12, pp. 2727-2734

TEXT: Silicate hydration was studied by taking the infrared absorption spectra. Acid silicates form from silicon-oxygen radicals by bridge formation over hydrogen atoms according to A - O - H ... O (A = Si). The properties of water contained in silicates were studied by means of the infrared spectra in the range of 1700-4000 cm^{-1}, and it was found that the water contained is no constitution water but is adsorbed between the layers of the silicate lattice. The absorption spectrum of water in dioptase ($Cu_6[Si_6O_{18}] \cdot 6H_2O$) was taken. The oscillation numbers of OH^- ions in crystalline silicates and hydroxo compounds were determined by measuring the absorption spectra of powders of these compounds. The hydrogen atom of the OH^- group is not able to form hydrogen bridges. To apply the

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Infrared Absorption Spectra of Hydrated Silicates

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B017/B064

infrared absorption spectra to structural analysis it is necessary to know the deformation oscillation of the hydroxyl group at which the hydrogen atom is displaced perpendicular to the binding direction. The oscillation number νOH is, above all, dependent on the degree of the covalence bond A - O. The capability of the SiOH group of forming shorter hydrogen bonds with active proton-acceptor atoms or -groups was proven. In the range of 3000 - 2000 cm^{-1}, the absorption spectra show the bands characteristic of the SiOH group. D. M. Kheyker, O. I. Gracheva, L. S. Zevin, and A. N. Lazarev are mentioned. There are 4 figures, 3 tables, and 44 references: 20 Soviet, 10 US, 6 British, 1 Canadian, 1 French, and 7 German.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR)

SUBMITTED: September 10, 1959

Card 2/2

TOROPOV, N.A.; VOLKONSKIY, B.V.

Polymorphous conversions of $3CaO \cdot SiO_2$ and the effect of ferrous oxide on $3CaO \cdot SiO_2$ and other clinker minerals. TSement 26 no. 6:17-20 N-D '60. (MIRA 13:12)
(Portland cement) (Silicates)

TOROPOV, N.A.; NIKOGOSYAN, Kh.S.; BOYKOVA, A.I.

Formation of dicalcium silicate α-hydrate. Dokl. AN SSSR 135 no.1: 98-100 N '60. (MIRA 13:11)

1. Institut khimii silikatov AN SSSR. Predstavleno akademikom N.V.Belovym.

(Calcium silicate)

22512

S/062/61/000/004/001/008
B118/B208

15.2100 1142, 1273, 1145

AUTHORS: Toropov, N. A., Galakhov, F. Ya., and Konovalova, S. F.

TITLE: Silicates of rare earth elements. 2. Phase diagram of the binary system gadolinium oxide - silicon dioxide

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, no. 4, 1961, 539-543

TEXT: The lanthanum silicate $2La_2O_3 \cdot 3SiO_2$ was synthesized and described for the first time by N. A. Toropov and I. A. Bondar' (Izv. AN SSSR, Otd. khim. n., 1959, 552), and its melting range in the system La_2O_3-SiO_2 was determined. The structure of gadolinium oxide described by C. E. Curtis, I. R. Johnson was not confirmed by these scientists. The purpose of the present work was therefore the study of the system Gd_2O_3-SiO_2. The authors proceeded from a 98.2% gadolinium oxide containing 1.75% of other rare earths, and powdery rock crystal (99.90% SiO_2). The study was performed in different ways by an annealing and hardening method. The phases

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were determined by X-ray analysis. The resultant phase diagram of the system Gd_2O_3-SiO_2 is shown in Fig. 1. The following three compounds were detected in this system: $Gd_2O_3 \cdot SiO_2$, $2Gd_2O_3 \cdot 3SiO_2$, and $Gd_2O_3 \cdot 2SiO_2$. The liquidus curve has two peaks corresponding to the melting of the compounds $Gd_2O_3 \cdot SiO_2$ and $2Gd_2O_3 \cdot 3SiO_2$, and three eutectics. The liquidus curve is drawn on the basis of the experimental annealing and hardening results. The melting point of gadolinium oxide Gd_2O_3 obtained by the authors is lower by about 150°C than that found by C. E. Curtis and I. R. Johnson. The roentgenograms of the authors agreed with those obtained by these workers. The compound $Gd_2O_3 \cdot SiO_2$ melts without decomposition at 1900°C. The roentgenograms as well as the optical data indicate the formation of the same compound. The compound $2Gd_2O_3 \cdot 3SiO_2$ is stable only in the range between 1630 and 1950°C; at 1950°C it melts without decomposition. Below 1630°C it is split into two other compounds, i.e., $Gd_2O \cdot SiO_2$ and $Gd_2O_3 \cdot 2SiO_2$. The compound $Gd_2O_3 \cdot 2SiO_2$ melts at 1720°C and decomposes to

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give $2Gd_2O_3 \cdot 3SiO_2$ and a liquid. Table 3 presents formulas and temperatures of the invariant points of the system Gd_2O_3-SiO_2. The oxy-orthosilicates $Gd_2O(SiO_4)$, the orthosilicates $Gd_4(SiO_4)_3$, and the pyrosilicates $Gd_2Si_2O_7$ have been synthesized and described. The authors determined the ranges of separation into layers and the respective upper-limit critical point. Fig. 2 shows roentgenograms of the compounds. There are 5 figures, 3 tables, and 5 references: 2 Soviet-bloc and 3 non-Soviet-bloc. The three references to English-language publications read as follows: F. P. Glasser, I. Warshaw, R. Roy, Amer.Ceram.Soc.Bull.38,169(1959); I. Warshaw, R. Roy, Amer.Ceram.Soc.Bull.38,169(1959); C. E. Curtis, I. R. Johnson, I.Amer.Ceram.Soc.40,15(1957).

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR)

SUBMITTED: January 18, 1960

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22513

S/062/61/000/004/002/008
B118/B208

15.2100 1142, 1273, 1145

AUTHORS: Toropov, N. A. and Bondar', I. A.

TITLE: Silicates of rare earth elements. 3. Phase diagram of the binary system yttrium oxide - silicon dioxide

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, no. 4, 1961, 544-550

TEXT: The purpose of the present study was the determination of the phase diagram of the system Y_2O_3-SiO_2. The starting materials were: silicon dioxide (99.9% SiO_2), yttrium oxide (the percentage content of the rare earth oxides was 99.9%, the content of yttrium oxide 99.42%, of the oxides of the other rare earths 0.55%, of Ca 0.02%, of Fe <0.01%, of copper 0.05%). The mixed samples were annealed and hardened. The resultant products were submitted to microscopic and X-ray structural analysis, in some cases also to chemical analysis. The constants of the Y_2O_3 obtained by the authors fairly corresponded to those in publications. The equal result indicates a cubic form of the yttrium oxide, which does not change

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Silicates of rare earth...

by melting in the electric arc. The roentgenogram of this product is given in diagram 1 б. The resultant phase diagram of the system Y_2O_3-SiO_2 is represented in Fig. 3. Compound $Y_2O_3 \cdot SiO_2$ melts without decomposition at 1980±50°C. Compound $2Y_2O_3 \cdot 3SiO_2$ melts without decomposition at 1950±50°C and remains stable between 1950 and 1650°; at 1950°C it decomposes into a mixture of the compounds $Y_2O_3 \cdot SiO_2$ and Y_2O_3-$2SiO_2$ (a reversible process: $2Y_2O_3 \cdot 3SiO_2 \rightleftarrows Y_2O_3 \cdot SiO_2 + Y_2O_3 \cdot 2SiO_2$). Compound $Y_2O_3 \cdot 2SiO_2$ melts with decomposition to $2Y_2O_3 \cdot 3SiO_2$ and a liquid, at 1775°C. Temperature and composition of the invariant points are given in Table 3. There are 6 figures, 5 tables, and 13 references: 4 Soviet-bloc and 9 non-Soviet-bloc. The three references to English-language publications read as follows: C. E. Curtis, I. R. Johnson, I.Amer.Ceram.Soc. 40, 15 (1957); C. E. Curtis, A. G. Tharp, I.Amer.Ceram.Soc. 42, 151 (1959); P. H. Aldred, A.E.S.White, Trans.Brit.Ceram.Soc. 58, 200 (1959).

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S/062/61/000/004/002/008
B118/B208

Silicates of rare earth...

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR)

SUBMITTED: January 18, 1960

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23586
S/062/61/000/005/001/009
B118/B208

152100 only 3309, 3609

AUTHORS: Toropov, N. A. and Bondar', I. A.

TITLE: Silicates of rare earth elements. Communication 4. New silicates in the system La_2O_3-SiO_2

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye khimicheskikh nauk, no. 5, 1961, 739 - 744

TEXT: In addition to the previously detected compound $2La_2O_3 \cdot 3SiO_2$, two further compounds $La_2O_3 \cdot SiO_2$ and $La_2O_3 \cdot 2SiO_2$ were found to be formed in the system La_2O_3-SiO_2. A new variant of the phase diagram of the system La_2O_3-SiO_2 is presented in the diagram 1, a, 6 basing on a method devised earlier. A range of demixing in wide temperature and concentration limits, and three compounds were found in the system: $La_2O_3 \cdot SiO_2$, $2La_2O_3 \cdot 3SiO_2$, and $La_2O_3 \cdot 2SiO_2$. Compound $La_2O_3 \cdot SiO_2$ (1:1) melts at 1930 ± 50°C without decomposition. The structural formula $La_2O_3 \cdot SiO_2$ may be understood as the

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S/062/61/000/005/001/009
B110/B208

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oxy-orthosilicate of lanthanum $La_2O(SiO_4)$. $2La_2O_3 \cdot 3SiO_2$ is stable between 1600 and 1975°C and melts at 1975°C without decomposition; at 1600°C it decomposes to give two compounds: $La_2O_3 \cdot SiO_2$ and $La_2O_3 \cdot 2SiO_2$. Compound $La_2O_3 \cdot 2SiO_2$ (1:2) melts at 1750°C and decomposes to $2La_2O_3 \cdot 3SiO_2$ and a liquid. This lanthanum silicate is a pyrosilicate with the formula $La_2Si_2O_7$ in structural respects. The range of separation into layers is represented in the phase diagram of the system by the binodal curve, with a critical temperature 2050°C of the state of demixing, and with the composition 25 % La_2O_3 and 75 % SiO_2 (in wt %). The lanthanum silicates are compared with a number of calcium and aluminum silicates. Table 4 compares the properties of the silicate $La_4(SiO_4)_3$ with those of α-$Ca_2(SiO_4)$. The study of the fine structure of this lanthanum silicate reveals a complete and exact analogy with the silicates of other elements. Table 2 gives the invariant points of the system La_2O_3-SiO_2. There are 6 figures, 4 tables, and 8 references: 4 Soviet-bloc and 4 non-Soviet-bloc. The 3 references to

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Silicates of rare earth...

English-language publications read as follows: E. M. Levin, St. Block, J. Amer. Ceram, Soc. 40 (3), 95 (1957); St. Block, E. M. Levin, J. Amer. Ceram. Soc. 40 (4), 113 (1957); E. M. Levin, St. Block, J. Amer. Ceram. Soc. 41 (2), 49 (1958).

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR)

SUBMITTED: March 25, 1960

Card 3/6

TOROPOV, N.A.; GREBENSHCHIKOV, R.G.

Fluoberyllates $MwBe_2F_5$ and their analogy to laminated silicates. Zhur.neor g.khim. 6 no.4:920-927 Ap '61. (MIRA 14:4)
(Fluoberyllates)

TOROPOV, N.A.; LIN' TSZU-SYAN [LIN TSU-HSIANG]

Study of the system $Li[AlSi_2O_6]$ - $Li[GaSi_2O_6]$. Zhur.neorg.khim. 6 no.4:928-932 Ap '61. (MIRA 14:4)

1. Institut khimii silikatov AN SSSR, Laboratoriya geterogennykh ravnovesiy.

(Lithium aluminum silicate)
(Lithium gallium silicate)

27900
S/078/61/006/010/008/010
B107/B101

15.2230

AUTHORS: Toropov, N. A., Kiseleva, T. P.

TITLE: The binary system neodymium oxide - alumina, and some data on the system neodymium oxide - alumina - silica

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 10, 1961, 2353 - 2358

TEXT: The authors studied the system Nd_2O_3 - Al_2O_3, using an electric microfurnace with tungsten heater designed by F. Ya. Galakhov, with which temperatures of up to 2200°C could be attained. The experiments were carried out in an argon atmosphere. The samples were studied microscopically using a МИМ-7 (MIM-7) metallographic microscope, roentgenographically, and by infrared spectroscopy using a ИКС-12 (IKS-12) spectroscope. The system Al_2O_3 - Nd_2O_3 has only one compound with a molar ratio of 1:1, and two eutectics: the first at 75 mole% of Nd_2O_3 and 25 mole% of Al_2O_3 and 1800°C, the second at 20 mole% of Nd_2O_3 and 80

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27900
S/078/61/006/010/008/010
B107/B101

The binary system...

mole% of Al_2O_3 and 1750°C (Fig. 1). The compound $Nd_2O_3 \cdot Al_2O_3$ melts congruently at 2070°C. The specific gravity is 7.031 g/cm^3, and the refractive index is 2.025 and 2.015. The infrared spectrum shows two bands: at 800 - 850 cm^{-1}, and at 1000 - 1100 cm^{-1}. The X-ray spacings are given in a table. The authors further examined the question whether an addition of Al_2O_3 eliminates the miscibility gap in the system Nd_2O_3 - SiO_2. This application of Al_2O_3 as a homogenizing agent has been recommended by Levin and Block (Ref. 3, see below). On the basis of theoretical considerations on the tetrahedral or octahedral coordination of aluminum in the melt, the following points of the ternary system were studied: 3.7 mole% of Al_2O_3, 14.3 mole% of Nd_2O_3, 82 mole% of SiO_2; 2.4 mole% of Al_2O_3, 14.6 mole% of Nd_2O_3, 83 mole% of SiO_2; 7.4 mole% of Al_2O_3, 13.7 mole% of Nd_2O_3, 78.8 mole% of SiO_2. Examination of quenched specimens disclosed that separation into layers had not ceased, but the size of the droplets of the separated phases had been reduced considerably. Aluminum seems to have octahedral coordination in this and in similar systems so

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27900
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B107/B101

The binary system...

that it cannot be used as a homogenizing agent. A. M. Kuchumova participated in the experiments. There are 6 figures, 1 table, and 3 non-Soviet references. The three references to English-language publications read as follows: Ref. 1: J. Warshaw, R. Roy. J. Amer. Ceram. Soc., 42, No. 9 (1959); Ref. 2: F. H. Aldred, A. E. White. Transaction of the British Ceramic Society, 58, No. 4, 200 (1960); Ref. 3: E. Levin, S. Block. J. Amer. Ceram. Soc., 41, No. 2 (1958).

SUBMITTED: September 24, 1960

Table X-ray data for $Nd_2O_3 \cdot Al_2O_3$

d	I	d	I	d	I
3.74	40	1.527	61	1.082	8
2.64	100	1.325	23	1.045	9
2.15	43	1.321	25	1.006	23
1.857	55	1.250	18	1.001	17
1.665	33	1.090	5		

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26399
S/062/61/000/008/001/010
B117/B206

15.2230

AUTHORS: Toropov, N. A., Galakhov, F. Ya., and Konovalova, S. F.

TITLE: Silicates of rare earths. Communication 5. Phase diagrams of the systems Dy_2O_3-SiO_2 and Er_2O_3-SiO_2

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye khimicheskikh nauk, no. 8, 1961, 1365-1371

TEXT: The authors investigated the binary systems Dy_2O_3-SiO_2 and Er_2O_3-SiO_2 according to the method explained in previous studies by N. A. Toropov et al. (Ref. 2: Izv. AN SSSR, Otd. khim. n., 1961, 539; Refs. 1, 3, 4: Izv. AN SSSR, Otd. khim. n., 1960, 154; Izv. AN SSSR, Otd. khim. n., 1961, 544; Izv. AN SSSR, Otd. khim. n., 1961, 916). The specimens were prepared from dysprosium oxide with a content of oxides of other rare earths of less than 0.6 %, from erbium oxide (99.1 %) with 0.85 % admixtures and from rock crystal powder (99.9C % SiO_2). Dysprosium oxide annealed at 1000°C has a cubical structure, refractive index of n=1.88 and melting point of 2210°C. After being alloyed in the electric

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Silicates of rare earths...

arc, it disintegrates into powder even at very fast cooling. After this treatment, however, the specimen contains a certain amount of a high-temperature variety. This could be ascertained when comparing the roentgenograms of a specimen annealed at 1000°C and one alloyed in the arc, as well as microscopically. The mean refractive index of the high-temperature phase is n=1.975. On the basis of experiments, dysprosium oxide must be classified as belonging to the group of polymorphous oxides of rare earths. This corresponds to the latest data by M. W. Shafer and R. Roy (Ref. 6: J. Amer. Ceram. Soc. 42, N 11 (1959)). Erbium oxide differs from dysprosium oxide by the fact that it does not disintegrate after being alloyed in the arc. The optical properties and roentgenograms of Er_2O_3 annealed at 1000°C and of that alloyed in the arc are identical. Presumably, Er_2O_3 only exists in cubical form in the temperature range of from 1000°C up to the melt. The refractive index is n=1.95, the melting point 2290°C. The phase diagram of the system $Dy_2O_3 \cdot SiO_2$ (Fig. 2) drawn up on the basis of the experimental annealing- and hardening results shows the existence of three compounds: $Dy_2O_3 \cdot SiO_2$, $2Dy_2O_3 \cdot 3SiO_2$ and $Dy_2O_3 \cdot 2SiO_2$. Compounds of similar compositions were also found in the system $Er_2O_3 \cdot SiO_2$

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Silicates of rare earths...

(Fig. 3). The optical properties and density of the compounds produced are contained in Table 3 and the calculated interplanar spaces in Table 4. The oxy-orthosilicates $Dy_2O[SiO_4]$ and $Er_2O[SiO_4]$ as well as the orthosilicates $Dy_4[SiO_4]_3$ and $Er_4[SiO_4]_3$ melt without decomposition. However, the latter two are only stable in a specific temperature range. Below this range, they decompose into oxy-orthosilicates and pyrosilicates. During melting, dysprosium pyrosilicate $Dy_2[Si_2O_7]$ decomposes into orthosilicate $Dy_4[SiO_4]_3$ and liquid. A great change of the properties of silicates of rare earths was first determined in erbium pyrosilicate $Er_2[Si_2O_7]$: in contrast to silicates with a lower ordinal number (Y, La, Sm, Gd, Dy), it melts without decomposition and has a corresponding maximum on the phase diagram of Er_2O_3-SiO_2. Moreover, it differs from other pyrosilicates by a much higher double refraction. Composition and temperature of the eutectics between oxy-ortho- and orthosilicates of both systems and the eutectic between ortho- and pyrosilicates of the Er_2O_3-SiO_2 system could not be exactly ascertained, and are therefore marked on the phase diagrams

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by dashed lines. Microscopic and roentgenographic investigations showed that the products, the composition of which lies between the silicates mentioned, consist of two corresponding phases. In these cases the course of the liquidus curve was determined from observing simultaneous meltings of two specimens in the microfurnace. The compositions of such pairs of specimens show differences of 1-2 %. Unmixing of the melts takes place in both systems. The upper critical point in the unmixing range lies at 2320°C in the system with dysprosium; composition 28 % Dy_2O_3 and 72 % SiO_2. In the system Er_2O_3-SiO_2 the critical point lies at 2280°C; composition 30 % Er_2O_3 and 70 % SiO_2. There are 4 figures, 6 tables, and 6 references: 4 Soviet and 2 non-Soviet-bloc. The references to English-language publications read as follows: C. E. Curtis, J. R. Johnson, J. Amer. Ceram. Soc. 40, N 1, (1957); M. W. Shafer, R. Roy. J. Amer. Ceram. Soc. 42, N 11 (1959).

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry AS USSR)

SUBMITTED: October 17, 1960

26400
S/062/61/000/008/002/010
B117/B206

15.2220

AUTHORS: Toropov, N. A., and Bondar', I. A.

TITLE: Silicates of rare earths. Communication 6. Phase diagrams of binary systems Sm_2O_3-SiO_2 and Yb_2O_3-SiO_2, and their comparison with known silicates of other rare earths

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye khimicheskikh nauk, no. 8, 1961, 1372-1379

TEXT: The authors investigated pyrochemical, crystallooptical, and roentgenographic properties of 12 synthetized compounds. They give phase diagrams for the systems Sm_2O_3-SiO_2 (Fig. 1, a=% by weight, b=mole%) and Yb_2O_3-SiO_2 (Fig. 2, a=% by weight, b=mole%). Other systems were described by the authors in previous studies (Ref. 1: N. A. Toropov, I. A. Bondar', Izv. AN SSSR. Otd. khim. n., 1959, 554; Ref. 2: Izv. AN SSSR. Otd. khim. n. 1960, 153; Ref. 4: Izv. AN SSSR. Otd. khim. n. 1961, 544; Ref. 5: Izv. khim. n. 1961, 739; Ref. 3: N. A. Toropov, F. Ya. Galakhov

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Silicates of rare earths...

and S.F. Konovalova, Izv. AN SSSR. Otd. khim. n. 1961, 539; Ref. 6: Detto, Izv. AN SSSR. Otd. khim. n. 1961, 1365). The compounds 1:1 ($Ln_2O_3 \cdot SiO_2$) and 2:3 ($2Ln_2O_3 \cdot 3SiO_2$) were found to melt in all systems without decomposition. In the systems La_2O_3-SiO_2, Y_2O_3-SiO_2 and Sm_2O_3-SiO_2, the compounds 1:2 ($Ln_2O_3 \cdot 2SiO_2$) decompose into compound 2:3 and liquid. In the system Yb_2O_3-SiO_2 the compound 1:2 melts without decomposition. The compounds 2:3 are stable in a certain temperature range. They decompose into 1:1 and 1:2 at temperatures from 1600 to 1675°C. This process is reversible. In structural respect the compounds mentioned may be prepared in the following way: $Ln_2O_3 \cdot SiO_2$ as oxy-orthosilicate $Ln_2O[SiO_4]$, $2Ln_2O_3 \cdot 3SiO_2$ as orthosilicate $Ln_4[SiO_4]_3$ and $Ln_2O_3 \cdot 2SiO_2$ as diorthosilicate (pyrosilicate) $Ln_2Si_2O_7$. Three electron configurations are stable: La^{3+}, Gd^{3+} and Lu^{3+}. Ce, Pr, Nd and Sm belong to the subgroup La; Tb, Dy, Ho and Y belong to the subgroup Gd; Er, Tu, Yb and Sc belong to the subgroup Lu. Table 1 gives the properties of the compounds investigated

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with regard to the type of compound and its belonging to one of the electron configurations, according to data by N. A. Toropov, F. Ya. Galakhov, and S. F. Konovalova. It may be seen that the melting points do not show any special dependence on the type of compound. A certain rule could be observed with respect to optical properties and densities. An increase of the refractive indices and the densities of La towards Sm, Y towards Gd, and Er towards Yb may be observed. Moreover, for each type of compounds a reduction of densities and refractive indices is characteristic at the transition from oxy-ortho- to ortho- and finally diorthosilicates. Oxy-ortho- and pyrosilicates are biaxial and optically positive. Orthosilicates are uniaxial and optically negative. Peculiarities of ytterbium and erbium pyrosilicates could be found for the first time. In contrast to the other pyrosilicates, $Er_2Si_2O_7$ and $Yb_2Si_2O_7$ melt without decomposition. Crystals of these compounds have a very strong double refraction, 0.028-0.030 against 0.01 of the other pyrosilicates. The X-ray analysis shows a similarity of the structures for corresponding lanthanum and samarium, gadolinium, dysprosium and yttrium, scandium, erbium and ytterbium compounds. It is possible that silicates of rare

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earths might produce isomorphous mixtures with each other. In this connection, isomorphism will be complete for a number of compounds, for others, an incomplete isomorphous substitution will be possible. In the systems investigated (of the metasilicate type), silicates of stronger acidity were not found experimentally at 1600°C and below. Their composition may be expressed by $Ln_2(SiO_3)_3$. This nearly corresponds to the composition for which unmixing starts in the systems (74-77 mole% SiO_2).

Table 2 shows the compositionsand temperatures of the coexistence of two liquids and cristobalite, the critical points of unmixing and the saturated composition of the liquid rich in modifier (Ln_2O_3). La may be seen to have the greatest radius (r=1.22 Å according to Pauling) and unmixing starts at 77 mole% SiO_2. Sm, Y and Yb follow, for which unmixing starts at 75.8, 74.8 and 73.7 mole% SiO_2. According to studies by E. M. Levin and St. Block (Ref. 9; 10, 11 see below), the saturated compositions of unmixing, i.e., the compositions of the liquids rich in modifier, may be calculated. Table 2 gives calculated values for four systems. O. A. Yesin and Ya. I. Ol'shanskiy are mentioned. There are

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Silicates of rare earths...

7 figures, 2 tables, and 13 references: 8 Soviet-bloc and 5 non-Soviet-bloc. The four references to English-language publications read as follows: E. M. Levin, St. Block, J. Amer. Ceram. Soc. 40, (3), 95 (1957); J. Amer. Ceram. Soc. 40, (4), 113 (1957); J. Amer. Ceram. Soc. 41, (2), 49 (1958); E. P. Glasser, I. Warshaw, R. Roy, Phys. Chem. Glasses 1, N 2, 39 (1960).

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry, AS USSR)

SUBMITTED: October 31, 1960

Table 1: Properties of some silicates of rare earths. Legend: 1) Type of compound; 2) type of electron configuration; 3) melting point, °C; 4) stability limit of the compound, °C; 5) refraction indices; 6) double refraction; 7) optical axes; 8) optical sign; 9) density g/cm^3; 10) oxy-orthosilicates; 11) orthosilicates; 12) pyrosilicates; 13) melting with decomposition; 14) melting without decomposition;

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S/063/61/006/006/001/006
A057/A126

AUTHOR: Toropov, N. A., Professor

TITLE: The latest status of silicate crystallochemistry

PERIODICAL: Zhurnal vsesoyuznogo khimicheskogo obshchestva imeni D. I. Mendeleyeva, v. 6, no. 6, 1961, 604 - 612

TEXT: This is a review of recent investigations into silicate crystallochemistry which show, according to the present author, an intensive development of theoretical, and applied silicate crystallochemistry specially in the following directions: The interpretation of structures of the silicates of rare earth elements, and silicates with the ratio Si : O = 1 : 5; investigations of fine mechanisms of phase transitions in silicates; the development of a new classification of siliciumoxide radicals; development of the basic elements of the transition from non-oriented structures; determination of the function of the proton in structure and transitions of hydrosilicates. Investigations in these fields were presented on different international congresses such as The Session of the International Union of Crystallographs dedicated to the 40th anniversary of the death of Ye. S. Fedorov (Leningrad, 1959), Congress on Crystallography (Cambridge, 1960),

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The latest status of silicate crystallochemistry

Simposium on Silicates with mono- and di-valent cations (Berlin, 1960), The Seventh International Ceramic Congress (London, 1960), and Fourth International Simposium on Cement Chemistry (Washington, 1960). Of special interest are investigations related to the connection between structure and physico-chemical properties of silicates as, for instance, adsorption properties of zeolites, or hydration properties of calcium and barium silicates, etc. Academician N. V. Belov and his students investigated the determining part for the formation of silicate structures containing big cations and rigid reinforcing prisms, strips, or lattices consisting of siliciumoxide octaeders, with big cations (Na, Ca, Zr, Mg etc). Corresponding studies were carried out on the zirconium silicate - seydozerite and the radical $[Si_2O_7]^{6-}$ was observed. A similar structure, in relation to oxygen, was observed (i. e., a diorthosilicate structure in zirconium silicate with a gross formula of an orthosilicate type) for lavenite. The same author investigated the structure of gadolinite in connection with studies on rare earth silicates carried out in the Institut khimii silikatov (Institute of Silicate Chemistry) and determined the formula $Fe^{2+}Y_2Be_2O_2Si_2O_8$ by comparing the structure of gadolinite with datolite. Two interesting examples for new insular radicals are structures of lovozerite [Ref. 4: V. V. Ilyukhin, N. V. Belov, DAN SSSR, 131, 1, 176 (1960)] studied by the

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The latest status of silicate crystallochemistry

aforementioned author, and of zunyite first described by L. Pauling [Ref. 6: Z. Kristall., 84, 442 (1933)], but recently revised by W. Barclay [Ref. 5: Kamb Acta Crystallogr., 13, 1, 15 (1960)]. Interesting details were observed in the structures of the two polymorphic different minerals epididymite and eudidymite by N. V. Belov and others and are discussed in the present paper. In the Institute of Silicate Chemistry of the AS USSR absorption infrared spectra of hydrated silicates were made by the present author [Ref. 26: Zh. neorg. khim., 5, 612 (1960)], and electronographic investigations of fine-dispersed kaolin and celadonite by B. V. Zvyagin [Ref. 27: Kristallografiya, 5, 40 (1960)] and cleared the type of packing of atoms. At the VII Intern. Ceram. Congr., London, 1960, a paper on investigations of new rare earth silicates was presented by the present author. There are 6 figures, 1 table and 33 references: 15 Soviet-bloc and 18 non-Soviet-bloc. The references to the 4 most recent English-language publications read as follows: S. G. Fleet, 5 Internat. Congr. of Inter. Union of Cryst. Cambridge Eng., 1960, p. 18; F. Liebau, F. Wodtcke, H. B. Bunge, 5 Internat. Congr., Int. Union Cryst. Cambridge Eng., 1960, p. 41; D. E. Appelman, 5 Intern. Congr., 1960, p. 27; H. F. W. Taylor, J. Appl. Chem., 10, 317 (1960).

ASSOCIATION: Institut khimii silikatov AN SSSR (Institute of Silicate Chemistry AS USSR)

30176
S/070/61/006/006/008/008
E132/E135

15.2220

AUTHORS: Toropov, N.A., and Vasil'yeva, V.A.

TITLE: Synthetic scandium silicates

PERIODICAL: Kristallografiya, v 6, no.6, 1961, 968-972 + 1 plate

TEXT: Mg and Sc often form isomorphous silicates but the behaviour of the systems scandia/silica and magnesia/silica is quite different. The phase diagram of the Sc_2O_3/SiO_2 system has been mapped (Fig.3). X-ray powder data are given for the compounds $Sc_2O_3.SiO_2$, Sc_2O_3, $2Sc_2O_3.3SiO_2$ and $Sc_2O_3.2SiO_2$ which occur. At the high silica end of the composition range two immiscible liquids are found, n_1 and n_2. Refractive indices were measured for the scandium silicates:

$Sc_2O(SiO_4)$: m.p. 1950°, 2V small, r.i. 1.850, 1.835 +ve. $d_{obs.} = 3.490$.

$Sc_2Si_2O_7$: m.p. 1860°, biaxial -ve. r.i. 1.803, 1.785, 1.754. $d_{obs.} = 3.390$.

Efforts were made to crystallise the compounds studied, but

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Synthetic scandium silicates

without success. N.V. Belov, V.V. Shcherbina, V.I. Lebedev and F.Ya. Galakhov are mentioned in the article for their contributions in silicate chemistry.
There are 3 figures, 1 table and 8 references: 6 Soviet-bloc and the following two English language references:
Ref.3: J.P. Marbel, J.J. Glass, Amer. Mineralogist, Vol.27(10), 696-698, 1942.
Ref.8: E. Levin, S. Block. J. Amer. Ceram. Soc., Vol.41, 2, 1958.

ASSOCIATION: Institut khimii silikatov
(Institute for Silicate Chemistry)

SUBMITTED: June 8, 1961

Card 2/2

TOROPOV, N.A.; KISELEVA, T.P.

Binary system neodymium oxide - alumina, and some data on the system neodymium oxide - alumina - silica. Zhur.neorg.khim. 6 no.10: 2353-2358 O '61. (MIRA 14:9)
(Neodymium oxide) (Alumina) (Silica)

TOROPOV, N.A.; GREBENSHCHIKOV, R.G.

Devitrification of bottle glass. Stek. i ker. 18 no. 3:12-14 Mr '61. (MIRA 14:5)
(Glass—Defects)

TOROPOV, N.A.; BARZAKOVSKIY, V.P.

Current problems of mineralogy and petrography. Vest. AN SSSR 31 no.8:120-121 Ag '61. (MIRA 14:8)
(Mineralogy)
(Petrology)

S/030/61/000/011/004/007
B105/B147

AUTHOR: Toropov, N. A., Doctor of Technical Sciences, Member of the Academy

TITLE: Important problems of silicate chemistry

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 11, 1961, 40-46

TEXT: The author reports on the present state and application of silicate chemistry. Silicates are widely used as cements, glass, porcelain, enamels, glazings, acidproof and refractory products. Scientific studies in the field of silicate chemistry are conducted by the Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry of the Academy of Sciences USSR) established in 1948, and by many other scientific organizations as well as schools of higher education. The silikatnaya sektsiya Vsesoyuznogo khimicheskogo obshchestva im. D. I. Mendeleyeva (Silicate Section of the All-Union Chemical Society imeni D. I. Mendeleyev) and its regional branches are mentioned. The Institute of Silicate Chemistry holds scientific conferences and discussions. The following main trends in the development of silicate chemistry are mentioned: Investigation of the fine

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Important problems of silicate chemistry

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crystallochemical structure of silicates; the structure of individual silicates including silicates of rare earths; hydrosilicates; dependence of structure on physical and chemical properties of silicates; synthesis and search for new types of materials with valuable physicochemical properties; elaboration of the technology of autoclave synthesis of various hydrosilicates for construction; determination of the position of hydrogen atoms, protons in the structures of hydrosilicates; synthesis of organosilicates; silicates of rare earths; investigation of phase diagrams of binary silicate systems; studies of new synthetic, porous, crystalline aluminosilicates; production and introduction of new protective agents of the enamel type and other high-temperature coatings for metals.

ASSOCIATION: Akademiya stroitel'stva i arkhitektury SSSR (Academy of Construction and Architecture USSR)

Card 2/2

TOROPOV, N.A.; BARZAKOVSKIY, V.P.

"Technology of the silicates" editied by R.Bárta. Reviewed by N.A. Toropov, V.P. Brazakovskii. Zhur. prikl. khim. 34 no.2:471-472 F '61. (MIRA 14:2)

(Silicates) (Bárta, R.)

27062
S/080/61/034/003/002/017
A057/A129

15:2330

AUTHORS: Toropov, N. A., Kiseleva, T. P.

TITLE: Synthesis and investigation of neodymium monoaluminate and neodymium silicates

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 3, 1961, 498-501

TEXT: Ceramic properties of neodymium monoaluminate ($Nd_2O_3 \cdot Al_2O_3$), oxyorthosilicate $Nd_2O_3 \cdot SiO_2$, orthosilicate $2Nd_2O_3 \cdot 3SiO_2$, and pyrosilicate $Nd_2O_3 \cdot 2SiO_2$ which compounds were observed in the systems $Nd_2O_3 - Al_2O_3$ and $Nd_2O_3 - SiO_2$, have been investigated in the present work. This research program on a promising new ceramic was started in connection with the development of new branches in science and industry, resulting in the need of new construction materials corresponding to modern requirements. In the literature there are several publications related to ceramic properties of pure rare earth oxides, especially with greater radii of electron capture required in nuclear techniques. Among these are investigations of C. E. Curtis and J. R. Johnson [Ref. 1: J. Am. Cer. Soc., 40, 1, 15-19 (1957)], C. L. Ploetz et al, [Ref. 2: J. Am. Cer. Soc., 41, 12, 551-554 (1958)], and C. E. Curtis and A. G. Tharp [Ref. 3: J.Am. Cer.

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Synthesis and investigation of neodymium ...

Soc., 3, 151-156 (1959)]. In the present experiments (carried out under assistance of A. M. Kuchumova) cylindrical test samples (diameter 15 mm, height 5-10 mm) were made by pressing (2,500 atm) the powdered ground mixtures of oxides after calcination at 800 - 900°C. The samples were fired in different types of ovens (silite, kryptol etc.) and it was observed that magnesite rests must be used for the samples to avoid interaction between the sample and the rest. A special preparation technique of mixtures was also developed in order to effect sintering of the samples. The initial silicate mixtures were obtained by co-precipitation from solutions, and thus fine disperse powders were prepared lowering herewith the sintering temperature for 200 - 250°C. Nd_2O_3 was dissolved in diluted HNO_3 and mixed with ethylsiliconester. After reaction the obtained precipitate was dried, calcinated (to remove nitrogen oxides), ground and test samples were prepared by pressing. No satisfactory sintering could be effected by firing the test samples in a silite oven at 1,500°C for several hours. Thus 1-2% admixtures of CaF_2, Na_2SiF_6, MgO, and also B_2O_3 (for aluminate samples only) were tested as mineralizers, i.e., fluxes. Elasticity of the obtained samples was determined by the ultrasonic wave method on a УЗИС-6 (UZIS-6) assembly, and microhardness on a ПМТ-3 (PMT-3) apparatus with diamond cone. The polished samples were also investigated on a МИМ-7 (MIM-7) metallographic microscope,

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Synthesis and investigation of neodymium ...

and a homogeneous structure was observed, except for the orthosilicate samples. It is shown in tables that the best results with respect to properties of the obtained ceramics were obtained with 1-2% CaF_2 admixtures. The least effective flux was Na_2SiF_6. It can be seen from the tabulated data that ceramic properties of neodymium monoaluminate exceed those of the silicates. Thus the modulus of elasticity is twice as high as that of porcelain, glass, magnesite refractories or chamotte. The speed of propagation of elastic deformation (5,964 m/sec) exceeds that in iron, steel, granite, glass and porcelain. The monoaluminate has a high thermal resistance (fusing point 2,070°C) and high microhardness (1,440 kg/mm^2). There is 1 table and 3 non-Soviet-bloc references.

ASSOCIATION: Leningradskiy tekhnologicheskiy institut imeni Lensoveta (Leningrad Technological Institute imeni Lensovet)

SUBMITTED: September 23, 1960

Table: Properties of neodymium silicates and monoaluminate

Legend: (1) material, (2) bulk density (g/cm^3), (3) rate of wave propagation (m/sec), (4) transversal waves, (5) longitudinal waves, (6) coefficient, (7) of sound refraction, (8) Poisson's, (9) modulus ($kg/m^2 \cdot 10^{-5}$), (10) of shear, (11) of elasticity, (12) microhardness (kg/mm^2), (13) water absorption (%), (14) apparent porosity, (15) (1,750°C, 40 h) without mineralizer, (16) all (1,800°C for 1h, and 1,600°C for 8 h), (17) (1,500°, 10 h), (18)(1,500°C, 20h), (19)(1,600°C, 20 h), (20)(1,600°C, 40 h) without mineralizer

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S/081/62/000/004/046/087
B156/B138

AUTHORS: Toropov, N. A., Kiseleva, T. P.

TITLE: Neodymium silicates

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 4, 1962, 377, abstract 4K192 (Tr. Leningr. tekhnol. in-ta im. Lensoveta', no. 52, 1961, 76 - 88)

TEXT: An SiO_2 - Nd_2O_3 equilibrium diagram has been investigated and plotted, and three neodymium silicates synthesized: $Nd_2O_3 \cdot SiO_2$, $2Nd_2O_3 \cdot 3SiO_2$ and $Nd_2O_3 \cdot 2SiO_2$. The first two silicates melt congruently at 1980 and 1960°C respectively, the third silicate melting incongruently at 1750°C. The densities of these silicates, found by pycnometer, are 4.476, 4.424 and 5.242 g/cm^3 respectively. [Abstracter's note: Complete translation.]

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TOROPOV, N.A.; BOUKOVA, A.I.; IYEVIN'SH, A.F. [Ieviņš, A.]; akademik APINITIS, S.K.

Formation of solid solutions between tricalcium and tristrontium silicates. Dokl. AN SSSR 137 no.4:882-884 Ap '61. (MIRA 14:3)

1. Institut khimii silikatov AN SSSR. 2. AN LatvSSR (for Iyevin'sh).
(Calcium silicate) (Strontium silicate)

TOROPOV, N. A.

5

CERAMICS, EUROPEAN ASSOCIATION OF - Eighth International Ceramic Congress - Copenhagen, Denmark, 21-25 May 62

BUDNIKOV, Petr P., Corresponding Member of the Academy of Sciences USSR, Professor and Head, Chair of General Silicate Technology, Moscow Chemical Technology Institute imeni D. I. Mendeleyev - "Mullite-carborundum and corundum-carborundum refractories resistant to spalling" (Section II)

TOROPOV, Nikita A., BONDAR, I. A., and GALAKHOV, F. Ya., Institute of Chemistry of Silicates, Academy of Sciences USSR- "Solid high temperature silicate solutions of rare earth elements" (Section I)

TOMANEK, Vladimir, Dipl. Ing., Dr., Prague- "New criteria for the evaluation of refractory clay and slate" (Section II)

KONOVALOV, P.F.; VOLKONSKIY, B.V.; KHASHKOVSKAYA, A.P.; TOROPOV, N.A., red.; ROTENBERG, A.S., red.; ROZOV, L.K., tekhn. red.

[Atlas of the microstructures of cement clinkers, refractories, and slags]Atlas mikrostruktur tsementnykh klinkerov, ogneupovov i shlakov. Pod red. N.A.Toropova. Leningrad, Gos.izd-vo lit-ry po stroit., arkhit. i stroit. materialam, 1962. 204 p. (MIRA 15:11)

1.Chlen-korrespondent Akademii nauk SSSR deystvitel'nyy chlen Akademii stroitel'stva i arkhitektury SSSR (for Toropov).
(Cement clinkers) (Refractory materials) (Slag)

C/005/62/000/010/003/004
D029/D109

AUTHORS: Grebenshchikov, R.G., and Toropov, N.A.

TITLE: Model relations of barium silicates and rubidium fluoberyllates

PERIODICAL: Silikat Technik, no. 10, 1962, 350 - 353

TEXT: The article, translated by N. Sieder from the Russian language and edited by M. Hähnert, Berlin, indicates unsolved problems of crystal chemistry of silicates and fluoberyllates with the purpose of inducing scientists to continue the research work in this field. It gives a review of crystal chemistry of the following compounds: Ba_3SiO_5 and Rb_3BeF_5, Ba_2SiO_4 and Rb_2BeF_4, Rb_2BeF_4-Na_2BeF_4, $BaSiO_3$ and $RbBeF_3$, $Ca_2BaSi_3O_9$ and $Na_2(K,Rb)Be_3F_9$, $Ba_2Si_3O_8$, $BaSi_2O_5$ and $RbBe_2F_5$, $MgBaSi_4O_{10}$and $LiRbBe_4F_{10}$, $LiRbBe_4F_{10}$, $MgBaSi_4O_{10}$-$Ba_2Si_4O_{10}$. The authors stress the necessity to continue the research in the field of the comparative crystal chemistry of Silicates (Germanates) and Fluoberyllates. There are 2 tables.

ASSOCIATION: Institut für Silikatchemie der Akademie der Wissenschaften der USSR (Institute for Silicate Chemistry of the Academy of Sciences of the USSR) Leningrad

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